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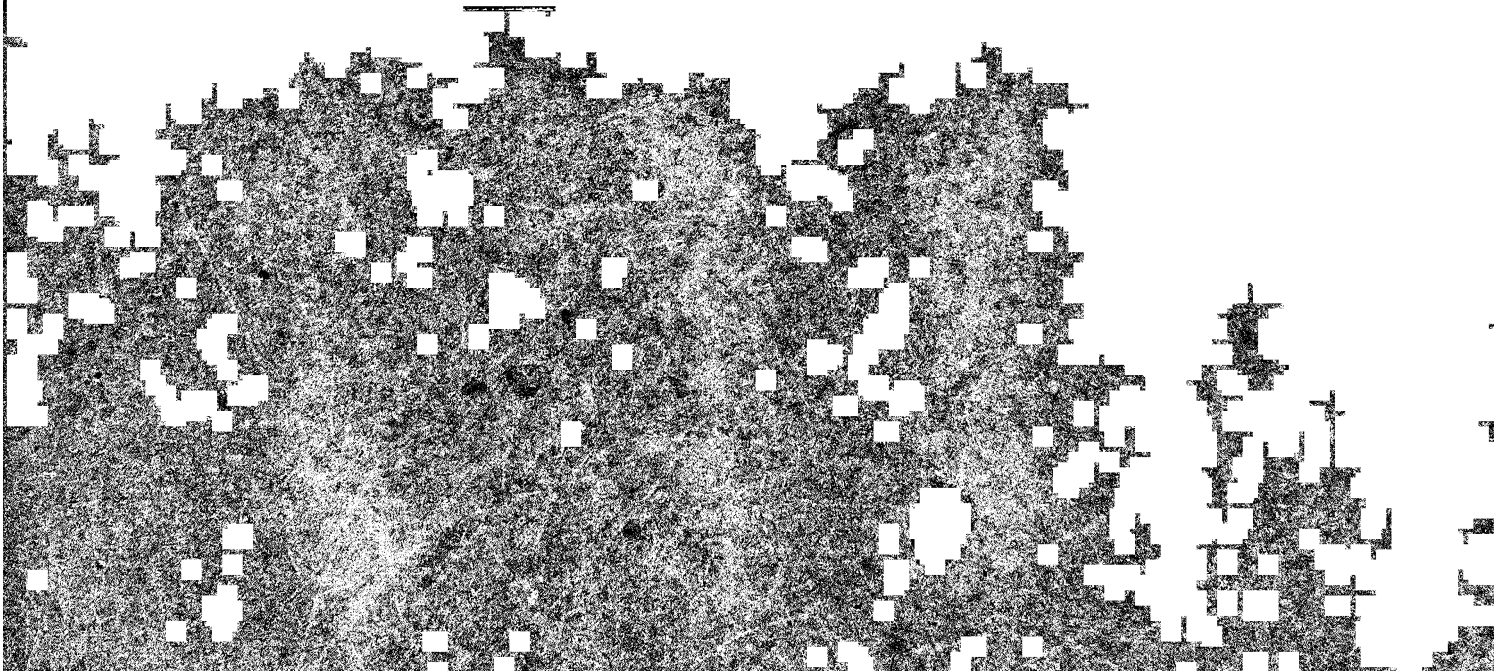

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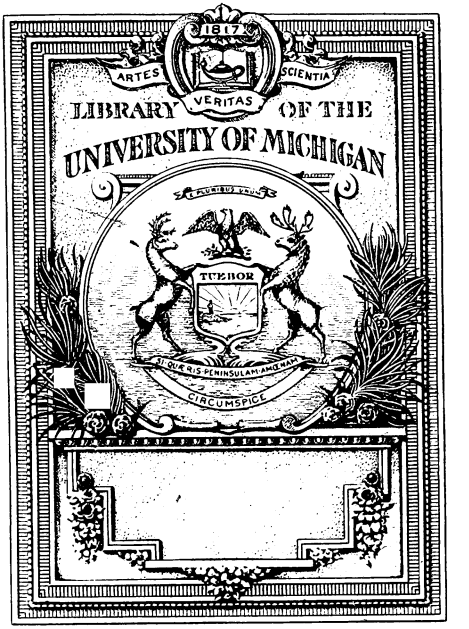

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TREATISE

ON

MINERALOGY.

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TREATISE

ON

MINERALOGY,

OR THE

NATURAL HISTORY OF THE MINERAL KINGDOM.

BY

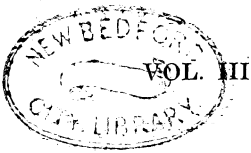
Friedrich
FREDERICK MOHS,

PROFESSOR IN THE MINING ACADEMY OF FREIBERG.

Translated from the German, with considerable Additions,

BY

WILLIAM HAIDINGER, F.R.S.E.



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Minerals, which will probably never form distinct Species in the Mineral System . . 177

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PHYSIOGRAPHY.

Order XI. GLANCE.

Genus I. COPPER-GLANCE.

1. TETRAHEDRAL COPPER-GLANCE.

Tetrahedral Copper-Pyrites. Jam. Syst. Vol. III. p. 315. Tetrahedral Copper-Glance. Man. p. 276. Grey Copper. Fahlerz. Phill. p. 300. Fahlerz. Schwarzerz. Wern. Hoffm. H. B. III. 2. S. 119. 127. Kupferfahlerz. Schwarzgiltigerz. Graugiltigerz? Hausm. I. S. 164. 166. 168. Fahlerz. Leonh. S. 262. Cuivre gris. Haüy. Traité, T. III. p. 537. Tabl. comp. p. 86. Traité, 2de Ed. T. III. p. 441.

Fundamental form. Hexahedron. Vol. I. Fig. 1.

Simple forms. H (f); $\frac{\overset{*}{O}}{2}$ (P) Vol. I. Fig. 13., Kapnik, Transylvania; — $\frac{O}{2}$ (e) Vol. I. Fig. 14.; D (o) Vol. I. Fig. 31.; A_2, Vol. I. Fig. 32; $\frac{B}{2}$, Vol. I. Fig. 17.; $\frac{\overset{*}{C_1}}{2}$ (l) Vol. I. Fig. 15., Kapnik; — $\frac{C_1}{2}$ (r) Vol. I. Fig. 16.

Char. of Comb. Semi-tessular with inclined faces.

Combinations. 1. $\frac{O}{2}$. — $\frac{O}{2}$. Fig. 158., Kapnik.

2. H. $\frac{O}{2}$. Cornwall.

3. $\frac{O}{2}$. $\frac{C_1}{2}$. Vol. I. Fig. 77. Kapnik.

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4. $\frac{O}{2}$. — $\frac{C_1}{2}$. Vol. I. Fig. 78. HAÜY.

5. H. $\frac{O}{2}$. D. Fig. 160. Schwatz, Tyrol.

6. $\frac{O}{2}$. D. $\frac{C_1}{2}$. The individuals of Fig. 161. Dillenburg.

Cleavage, octahedron, imperfect. Fracture conchoidal, of different degrees of perfection. Surface: the tetrahedron and the trigonal dodecahedron in the normal position, ($\frac{O}{2}$ and $\frac{C_1}{2}$), generally irregularly streaked, parallel to their common edges of combination, not rough; the dodecahedron sometimes a little rough; the tetrahedron in the inverse position very rough. Some varieties are subject to tarnish.

Lustre metallic. Colour steel-grey ... iron-black. Streak unchanged, sometimes inclining to brown.

Rather brittle. Hardness = 3·0 ... 4·0. Sp. Gr. = 5·104, from Cremnitz; = 4·950, from Kapnik; = 4·798, from Schwatz.

Compound Varieties. Twin-crystals: 1. Axis of revolution perpendicular, face of composition parallel to a face of the octahedron; the individuals are continued beyond the face of composition. Fig. 161. Massive: composition granular, of various sizes of individuals, strongly connected, and often impalpable; fracture uneven.

OBSERVATIONS.

1. The varieties comprised within the species of tetrahedral Copper-pyrites are so different from each other, and

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in part even in such properties as possess the greatest influence on their natural-historical determination, that the possibility cannot be denied of their requiring in future a division into several species. Mineralogists have not hitherto succeeded in fixing the limits required for this distinction, and the present imperfect state of our information leaves us nothing to do but to consider them as varieties of one and the same species. Perhaps the difference between the *Antimonial* and the *Arsenical Grey Copper*, the *Schwarzerz* and *Fahlerz* of WERNER, is founded in nature, though the characters upon which their distinction depends, are particularly Colour, Fracture, and Lustre, in all of which we meet very often with complete transitions. It would be improper to reflect here on the chemical composition, since this can be properly judged of only after having previously completed the determination of the species. The colour of the Fahlerz approaches more to steel-grey; its fracture is uneven, and it possesses low degrees of lustre; while the Schwarzerz is nearly iron-black, and has a bright, more or less perfect conchoidal fracture. There are certain varieties of both, which can be distinguished at first sight; but other varieties presenting intermediate stages in the passages of these properties, have hitherto baffled all attempts to reduce the differences to fixed limits.

2. KLAPROTH obtained the following results from analysing two varieties of tetrahedral Copper-glance, one of Fahlerz and one of Schwarzerz.

Copper	48·00	40·25.
Arsenic	14·00	0·75.
Antimony	0·00	23·00.
Sulphur	10·00	18·50.
Iron	25·50	13·50.
Silver	0·50	0·30.

Other varieties contain the same ingredients in other proportions. Some, moreover, contain zinc, or mercury, or lead, and in some varieties as much as $13\frac{1}{2}$ per cent. of silver has been discovered, in others a small quantity of gold. They differ in their reactions before the blowpipe.

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Some yield arsenic, others antimony, when roasted, and the residue melts in different ways. After roasting, they yield a globule of copper.

3. The tetrahedral Copper-glance partakes in the modes of occurrence of the pyramidal Copper-pyrites, and is found in beds and veins; but it occurs seldom or not at all in the repositories of Tin-ore. It is accompanied by the same minerals as pyramidal Copper-pyrites, frequently also by prismatic Hal-baryte.

4. Varieties considered as Fahlerz are found in veins near Freiberg in Saxony, and in beds in Anhalt, in the county of Gömör in Hungary, in Stiria, &c.; varieties called Schwarzerz are met with in veins at Schwatz and other places in Tyrol, at Kapnik in Transylvania, at Cremnitz in Hungary, also at Clausthal and Andreasberg in the Hartz. Tetrahedral Copper-glance occurs besides in the neighbourhood of Dillenburg; in Mansfeld; in small quantities at Airthrie and other places in Scotland; in Cornwall, and in America.

2. PRISMATOIDAL COPPER-GLANCE.

Prismatic Antimony-Glance. JAM. Syst. Vol. III. p. 407. Prismatoidal Copper-Glance. Man. p. 277.

Fundamental form. Scalene four-sided pyramid of unknown dimensions. Vol. I. Fig. 7.

Simple forms. $P + \infty$ (M); $\breve{P}r$ (P); $\breve{P}r + \infty$ (h).

Char. of Comb. Prismatic. Combination. 1. $\breve{P}r$. $P + \infty$. $\breve{P}r + \infty$. Sim. Fig. 9.

Cleavage, $\breve{P}r + \infty$ rather perfect, though interrupted. Fracture imperfect conchoidal. Surface rough.

Lustre metallic. Colour blackish lead-grey. Streak unchanged.

Brittle. Hardness = 3·0. Sp. Gr. = 5·735.

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Compound Varieties. Massive: composition granular, individuals strongly connected.

OBSERVATIONS.

1. The prismatoidal Copper-glance has been hitherto found only in the beds of brachytypous Parachrose-baryte at St Gertraud near Wolfsberg in the valley of Lavant in Carinthia. It is very nearly allied to the following species. It will depend upon future accurate examinations, particularly of its regular forms, whether or not the varieties of the two species are identical.*

2. Before the blowpipe the present species gives very nearly the same results as the following one. It appears to contain sulphur, antimony, lead, and copper, and it yields also a little silver, for the extraction of which it is collected by the miners, without, however, properly speaking, being an object of mining.

3. DI-PRISMATIC COPPER-GLANCE.

Axifrangible Antimony-Glance, or Bournonite. JAM. Syst. Vol. III. p. 399. Bournonite. Triple Sulphuret. PHILL. p. 336. Schwarzspiesglaserz. WERN. Hoffm. H. B. IV. 1. S. 111. Bleifahlerz. Spiessglanzbleierz. HAUSM. I. S. 170. 173. Bournonit. LEONH. S. 155. Plomb sulfuré antimonifère. HAÜY. Tabl. comp. p. 80. Antimoine sulfuré plombo-cuprifère. Traité de Crist. T. II. p. 483.

Fundamental form. Scalene four-sided pyramid. P = 136° 7′, 66° 13′, 133° 3′. Vol. I. Fig. 9. AP.

$$a : b : c = 1 : \sqrt{1{\cdot}137} : \sqrt{0{\cdot}226}.$$

Simple forms. P — ∞ (*k*); P — 1; P (*P*); (P̆r — 1)^5 (*y*) = 114° 14′, 115° 2′, 109° 16′;

---

* The present species was determined by Professor MOHS, before he was acquainted with any of the varieties of the following one. Though it is likely that they do not present any specific difference, it would be too precipitate to unite them, without being capable of affording a demonstration of their identity. H.

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$(\breve{P}r + \infty)^3$ $(n) = 96°31'$; $(\bar{P}r - 2)^5$; $(\bar{P}r - 1)^3$; $\breve{P}r - 1$ $(e) = 129° 45'$; $\breve{P}r$ $(d) = 93° 40'$; $\breve{P}r + 1$ $(f) = 54° 48'$; $\breve{P}r + \infty$ (s); $\bar{P}r - 1$ $(o) = 87° 8'$; $\frac{5}{4}\bar{P}r = 64° 44'$; $\dot{P}r$ $(p) = 50° 51'$; $\dot{P}r + \infty$ (r).

Char. of Comb. Prismatic.

Combinations. 1. $P - \infty$. $\dot{P}r - 1$. $\breve{P}r$. $\dot{P}r + \infty$. $\breve{P}r + \infty$. Fig. 24. Bräunsdorf, Saxony.

2. $P - \infty$. $\dot{P}r - 1$. P. $(\breve{P}r + \infty)^3$. $\breve{P}r + \infty$. $\bar{P}r + \infty$. Neusohl, Hungary.

3. $P - \infty$. $\breve{P}r - 1$. $\breve{P}r$. $\breve{P}r + 1$. $\bar{P}r - 1$. $(\breve{P}r - 1)^3$. P. $\dot{P}r$. $(\breve{P}r + \infty)^3$. $\breve{P}r + \infty$. $\bar{P}r + \infty$. Fig. 181. Cornwall.

4. $P - \infty$. $\breve{P}r - 1$. $\bar{P}r - 1$. $P - 1$. $\breve{P}r$. $\frac{5}{4}\bar{P}r$. $(\breve{P}r - 1)^3$. $(\bar{P}r - 2)^5$. $\bar{P}r$. $(\bar{P}r - 1)^3$. P. $(\breve{P}r + \infty)^3$. $\breve{P}r + \infty$. $\bar{P}r + \infty$. Neudorf, Anhalt.

Cleavage, imperfect; the most distinct is parallel to $\breve{P}r + \infty$, less distinct cleavages are observed parallel to $P - \infty$ and $\bar{P}r + \infty$; traces of $\bar{P}r - 1$ and $(\breve{P}r + \infty)^3$. Fracture conchoidal, uneven. Surface, nearly equal in all the forms, often highly smooth and splendent. The striæ parallel to the intersections with $\breve{P}r$ almost always depend upon regular composition.

Lustre metallic. Colour steel-grey, inclining to blackish lead-grey or iron-black, according to the physical quality of the surface. Streak unchanged.

Brittle. Hardness = 2·5 ... 3·0. Sp. Gr. = 5·763, crystals from Anhalt.

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Compound Varieties. Twin-crystals: axis of revolution perpendicular, face of composition parallel to a face of the horizontal prism P̆r. The individuals are generally continued beyond the face of composition. The axes of two individuals cross each other at angles of 93° 40′ and 86° 20′. The composition is frequently repeated in parallel layers, and forms striæ upon the faces, particularly upon the pyramid P, and upon the prism P̆r itself, but also upon those which produce with it parallel edges of combination. The situation of these striæ is useful for discovering the true position of the faces of pyramids and prisms. Massive: composition granular, strongly connected.

OBSERVATIONS.

1. Two varieties, one from Cornwall, and another from Clausthal, have yielded to KLAPROTH,

Antimony	28·50	19·75.
Lead	39·00	42·50.
Copper	13·50	11·75.
Iron	1·00	5·00.
Sulphur	16·00	18·00.

Before the blowpipe upon charcoal it melts, smokes, and yields afterwards a black globule. In a strong heat the charcoal becomes covered with oxide of lead. It is easily soluble in heated nitric acid.

2. Di-prismatic Copper-glance has been hitherto found only in veins, and is accompanied by axotomous and prismatoidal Antimony-glance, hexahedral Lead-glance, dodecahedral Garnet-blende, &c.

3. The first varieties of this species noticed by mineralogists were those from Cornwall, where they occur with axotomous Antimony-glance in Wheal Boys in the parish of Endellion near Redruth. Another variety, from

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Kapnik in Transylvania, where it is found with dodecahedral Garnet-blende, tetrahedral Copper-glance, &c. had likewise been known long ago. It has been found afterwards in large and magnificent crystals, at Neudorf in Anhalt, also at Andreasberg in the Hartz. It occurs at Bräunsdorf in Saxony in a vein of rhombohedral Quartz, containing argentiferous prismatic Arsenical-pyrites, at Neusohl in Hungary, at Offenbanya in Transylvania, with ores of gold, and in other localities.

4. PRISMATIC COPPER-GLANCE.

Rhomboidal Copper-Glance, or Vitreous Copper-Ore. JAM. Syst. Vol. III. p. 328. Prismatic Copper-Glance, or Vitreous Copper. Man. p. 278. Vitreous Copper. Sulphuret of Copper. PHILL. p. 297. Kupferglas. WERN. Hoffm. H. B. III. 2. S. 103. Kupferglanz. HAUSM. I. S. 142. Kupferglanz. LEONH. S. 254. Cuivre sulfuré. HAÜY. Traité, T. III. p. 551. Tabl. comp. p. 87. Traité, 2de Ed. T. III. p. 454.

Fundamental form. Scalene four-sided pyramid. $P = 126° 52', 125° 22', 80° 6'$. Vol. I. Fig. 9. AP.

$$a : b : c = 1 : \sqrt{2{\cdot}95} : \sqrt{2{\cdot}80}.$$

Simple forms. $P - \infty$; P (P); $(\breve{P}r + \infty)^3$ (d) $= 63° 48'$; $(\bar{P})^3$ $(a) = 148° 20', 65° 28', 124° 11'$; $(\bar{P}r + \infty)^5$ $(e) = 114° 16'$; $\breve{P}r$ $(o) = 119° 35'$; $\frac{3}{4}\breve{P}r + 1 = 97° 41'$; $\breve{P}r + \infty$ (p); $\bar{P}r + \infty$ (s).

Char. of Comb. Prismatic.

Combinations. 1. $\breve{P}r$. $\breve{P}r + \infty$. $\bar{P}r + \infty$.

2. $(\bar{P})^3$. $(\bar{P}r + \infty)^5$. $\bar{P}r + \infty$. Sim. Fig. 7. The individuals of Fig. 41.

3. $\breve{P}r$. P. $(\bar{P})^3$. $(\bar{P}r + \infty)^5$. $\breve{P}r + \infty$. $\bar{P}r + \infty$. Sim. Fig. 30. All of them from Cornwall.

Cleavage, traces of $\breve{P}r$, very imperfect. Fracture conchoidal. Surface, most of the forms smooth, only the faces parallel to the axis, and

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particularly $\breve{P}r + \infty$, are streaked parallel to their common intersections, often deeply furrowed.

Lustre metallic. Colour blackish lead-grey. Streak unchanged, sometimes shining.

Very sectile. Hardness = 2·5 ... 3·0. Sp. Gr. = 5·695, the compact variety from the Bannat.

Compound Varieties. Twin-crystals: 1. Axis of revolution perpendicular to one or to both faces of $\breve{P}r$; face of composition parallel to it; Sim. Fig. 38., only that the re-entering angles between *l* and *l* are filled up; 2. Axis of revolution perpendicular, face of composition parallel to a face of $(\breve{P}r)^3$, the individuals are continued beyond the face of composition, Fig. 41. The inclination of *s* on *s'* is equal to that of the acute terminal edge of $(\breve{P}r)^3$ = 88° 9′ on one side, and = 91° 51′ on the other; the respective inclinations of *a* on *a'* are = 153° 37′ and = 157° 19′. Massive: composition granular, of various sizes of individuals, generally small, and often impalpable; in the last case, the fracture becomes uneven, even or flat conchoidal. Plates.

OBSERVATIONS.

1. The division of Vitreous Copper in the Wernerian system, into *foliated* and *compact* Vitreous Copper, depends upon the state of mechanical composition and the perfection of cleavage. But few varieties only are comprehended in the first subspecies, namely, such as possess a granular composition and distinct traces of cleavage. Far the greater part is compact Vitreous Copper, which embraces not only the compact varieties, consisting of impalpable individuals,

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but by a curious anomaly also the crystals, in which but indistinct traces of cleavage can be observed. There exist transitions among all these varieties.

2. According to KLAPROTH, it consists of

Copper	76·50	78·50.
Sulphur	22·00	18·50.
Iron	0·50	2·25.
Silica	0·00	0·75.

It is the sulphuret of copper, Cu S, in which the proportion of copper and sulphur is, according to BERZELIUS, = 79·73 : 20·27. In the oxidating flame of the blowpipe it melts and emits with a noise glowing drops. In the reducing flame it becomes covered with a coat, and does not melt. If the sulphur has been driven off, a globule of copper remains. In heated nitric acid the copper is dissolved, and the solution assumes a green colour, but the sulphur remains undissolved.

3. If we except the tetrahedral Copper-glance, the present species is among those belonging to the genus, the one which occurs most frequently in nature, both in beds and veins. It is associated chiefly with other ores of copper, with hexahedral Iron-pyrites, rhombohedral Quartz, &c. It is one of those minerals which, by decomposition, are converted into copper-black.

4. Large and well defined crystals of this species occur in several mines near Redruth and in other districts, in Cornwall. In that place, and in the vicinity of Freiberg, the present species occurs in veins. Compound varieties, and in a few rare instances also crystals, have been found in beds in the Bannat of Temeswar, near Catharinenburg in Siberia, in Mansfeld, in Hessia, &c.; in the two last countries in bituminous shale. The fossil corn-ears, which were referred by LINNÆUS to the genus *Phalaris*, from Frankenberg in Hessia, consist in part of prismatic Copper-glance, and contain often a little native Silver. Prismatic Copper-Glance is found in the district of Siegen, in the mines of Kupferberg and Rudelstadt in Silesia, in Sweden, Norway, and

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other countries. The foliated variety is found in Cornwall, in the Bannat, in Siegen, and in Mansfeld.

5. It is a rich and highly valuable ore of copper.

GENUS II. SILVER-GLANCE.

1. HEXAHEDRAL SILVER-GLANCE.

Hexahedral Silver-Glance. JAM. Syst. Vol. III. p. 338. Man. p. 279. Sulphuret of Silver. Vitreous Silver. PHILL. p. 288. Glaserz. WERN. Hoffm. H. B. III. 2. S. 57. Glanzerz. HAUSM. I. S. 136. Silberglanz. LEONH. S. 169. Argent sulfuré. HAÜY. T. III. p. 398. Tabl. comp. p. 74. Traité, 2de Ed. T. III. p. 265.

Fundamental form. Hexahedron. Vol. I. Fig. 1.

Simple forms. $\dot{H}$ (*r*) Himmelsfürst, Freiberg; $\dot{O}$ (*n*) Vol. I. Fig. 2., Joachimsthal, Bohemia; $\dot{D}$ (*s*), Vol. I. Fig. 31., Himmelsfürst; $\dot{C}_1$ (*o*) Vol. I. Fig. 34., Morgenstern mine, Freiberg.

Char. of Comb. Tessular.

Combinations. 1. H. O. Vol. I. Fig. 3. and 4. 2. H. D. Fig. 151. 3. H. C_1. Fig. 153. 4. H. O. D. C_1. All of them from the mines near Freiberg.

Cleavage, sometimes traces parallel to the dodecahedron. Fracture imperfect and small conchoidal, uneven. Surface, nearly of the same description in all the forms, often uneven, and possessing low degrees of lustre. Subject to tarnish.

Lustre metallic. Colour blackish lead-grey. Streak shining.

Malleable. Hardness = 2·0 ... 2·5. Sp. Gr. = 7·196, crystals from Freiberg.

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Compound Varieties. Reticulated, arborescent, dentiform, filiform, and capillary shapes: individuals sometimes distinguishable, sometimes impalpable; the dentiform and some other imitative shapes are longitudinally streaked. Massive: composition impalpable; fracture uneven. Plates, and superficial coatings.

OBSERVATIONS.

1. According to KLAPROTH, the hexahedral Silver-glance is composed of

Silver 85·00.
Sulphur 15·00.

It is $Ag\ S^2$, according to BERZELIUS, which would make the proportion = 87·05 : 12·96. It is easily fusible before the blowpipe, and intumesces, but it gives a globule of silver by a continuation of the blast. It is soluble in dilute nitric acid.

2. It has been hitherto found almost exclusively in veins, accompanied by a great variety of species, particularly ores of silver, lead, and antimony, dodecahedral Garnet-blende, several species of the order Pyrites and of the genus Lime-haloide. Sometimes, though rarely, it is found along with hexahedral Gold. The rock adjoining the veins is often impregnated with it, and it is itself often covered with Silver-black, which sometimes owes its formation to the decomposition of hexahedral Silver-glance.

3. There are but few localities where the present species is found in any considerable quantity. It occurs at Freiberg, Marienberg, Annaberg, Schneeberg, Johanngeorgenstadt in Saxony; in Bohemia, principally at Joachimsthal; at Schemnitz and Cremnitz in Hungary, where it is called *Weichgewächs*; in the Koliwan mountains in Siberia, in Mexico and Peru. It has been found in smaller quantities, both massive and crystallised, in several mines of Cornwall, in the Hartz, in Norway, in Dauphiny, &c.

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4. The hexahedral Silver-glance is an important species for the extraction of silver.

GENUS III. LEAD-GLANCE.

1. HEXAHEDRAL LEAD-GLANCE.

Hexahedral Galena or Lead-glance. JAM. Syst. Vol. III. p. 353. Man. p. 280. Galena. Sulphuret of Lead. Blue Lead. PHILL. p. 332. 335. Bleiglanz. Blau-Bleierz. WERN. Hoffm. H. B. IV. 1. S. 1. 13. Bleischweif. Bleiglanz. HAUSM. I. S. 178. 179. Bleiglanz. LEONH. S. 225. Plomb sulfuré. HAÜY. Traité, T. III. p. 456. Tabl. comp. p. 79. Traité, 2de Ed. T. III. p. 341.

Fundamental form. Hexahedron. Vol. I. Fig. 1.

Simple forms. H (*P*), Freiberg; $\overset{*}{O}$ (*c*) Vol. I. Fig. 2., Bleiberg; D (*o*) Vol. I. Fig. 31.; B (*l*) Vol. I. Fig. 33.; C_2 (*z*) Vol. I. Fig. 34.

Char. of Comb. Tessular.

Combinations. 1. H. O., Vol. I. Fig. 3. and 4. Alston, Cumberland.

2. H. O. D. Pfaffenberg mine, Anhalt.

3. H. O. C_2. Przibram, Bohemia.

4. H. O. D. B. Fig. 155. Feistritz, Stiria.

Cleavage, hexahedron, highly perfect, and easily obtained. Fracture conchoidal, seldom observable. Surface, the hexahedron and the trigonal-icositetrahedron streaked parallel to the edges of combination with the octahedron. Sometimes subject to tarnish.*

* Mr ALLAN first observed, in several specimens in his own cabinet, that in some combinations of the hexahedron with the octahedron from Alston, the faces of the octahedron are tarnished, and present iridescent tints, while those of the hexahedron have retained their original lead-grey colour. H.

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Lustre metallic. Colour pure lead-grey. Streak unchanged.

Rather sectile. Hardness = 2·5. Sp. Gr. = 7·568, of a cleavable variety.

Compound Varieties. Twin-crystals: face of composition parallel, axis of revolution perpendicular to a face of the octahedron. The individuals either terminate at the face of composition, or they reach beyond it, and are often compressed in the direction of the axis of revolution. It is found at Kapnik in Transylvania. Reticulated, tabular, and some other imitative shapes, the individuals of which are often still observable. Massive: composition granular, of various sizes of individuals, sometimes impalpable. In this case the colour becomes pale or whitish lead-grey, the fracture even, or flat conchoidal, and the streak shining. The granular particles of composition sometimes become elongated or compressed in one direction, and then approach to columnar or lamellar ones. Pseudomorphoses of rhombohedral Lead-baryte. Plates, &c.

OBSERVATIONS.

1. The substance called *Blue Lead* is generally separated from the species of hexahedral Lead-glance, and considered as a species of its own. The varieties of it, however, are nothing else but the form of rhombohedral Lead-baryte, filled up with the substance of hexahedral Lead-glance, sometimes in pretty coarse granular compositions, as in the varieties from Poullaouen in Brittany, sometimes quite compact, as in some of those from Zschopau in Saxony. The Blue Lead from Cornwall sometimes shews composition. The remainder of the species has been divided into

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Common and *Compact Lead-glance*, according to the crystallised state of the individuals, or the size of the grain in the compositions. By decomposition sometimes a black sooty substance is produced, called *Friable Lead-glance.*

2. According to THOMSON, the hexahedral Lead-glance consists of

Lead	85·13.
Sulphur	13·02.
Iron	0·50.

It is $Pb\ S^2$, the proportions of lead and sulphur being = 86·55 : 13·45. Some varieties contain a small quantity of silver, others antimony. Before the blowpipe it melts, if it is heated with precaution, and yields globules of metallic lead, after the sulphur has been driven off. It is partly soluble in nitric acid, and leaves a white residue.

3. Hexahedral Lead-glance is frequently found in veins, but also in great quantity in beds, particularly in limestone rocks. In beds it is accompanied by various other ores of lead, also by dodecahedral Garnet-blende, several species of Pyrites, Iron-ore, &c.; in veins it occurs, besides these, along with ores of silver, copper, and antimony, sometimes with hexahedral Gold. In both kinds of repositories it is associated with octahedral Fluor-haloide, rhombohedral Lime-haloide, rhombohedral Quartz, and many other species.

4. The remarkable beds of hexahedral Lead-glance in Carinthia, which occur in limestone, and are worked at Deutsch-Bleiberg, Windisch-Bleiberg, Windisch-Kappel, Ebriach, and other places, possess in several respects a striking similarity to those of Derbyshire, Durham, and Northumberland, in England, in both of which countries they are accompanied and intersected by lead veins. But it is also found in beds in older rocks, as in Stiria, Carinthia, &c. In veins it occurs in rocks of various ages, from gneiss to the coal formations, in several parts of Saxony and Bohemia, in the Hartz, in Anhalt, in Hungary, in Transylvania, in France, in Scotland, and in many other countries.

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Fine crystals have been obtained from the Pfaffenberg mine near Neudorf in Anhalt, from Saxony, from Transylvania, from Cumberland and Durham, &c. Compact Lead-glance chiefly occurs at Freiberg in Saxony, in the Hartz, in Carinthia, and at Leadhills in Scotland. The localities of Blue Lead have been mentioned above.

5. Hexahedral Lead-glance is that mineral which yields most of the lead annually produced. On account of its generally containing a small quantity of silver, it is also employed to a considerable extent for the extraction of that metal, or also of gold, if it contains an admixture of it, which is sometimes the case. Potters use either the hexahedral Lead-glance itself reduced to powder, or the litharge produced from it for glazing coarse pottery.

Genus IV. TELLURIUM-GLANCE.

1. PRISMATIC TELLURIUM-GLANCE.

Prismatic Black Tellurium. Jam. Syst. Vol. III. p. 369. Prismatic Tellurium-Glance. Man. p. 281. Black Tellurium. Phill. p. 328. Nagyager-Erz. Wern. Hoffm. H. B. IV. 1. S. 134. Blättertellur. Hausm. I. S. 132. Blätter-Tellur. Leonh. S. 182. Tellure natif aurifère et plombifère. Haüy. Traité, T. IV. p. 327. Tellure natif auro-plombifère. Tabl. comp. p. 119. Traité, 2de Ed. T. IV. p. 381.

Fundamental form. Scalene four-sided pyramid*. Vol. I. Fig. 9.

Simple forms. $P - \infty$; $P + \infty = 90°$ (nearly); $\breve{P}r + \infty$; $\bar{P}r + \infty$.

Char. of Comb. Prismatic.

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* According to Phillips and Brooke, it is an acute isosceles pyramid, the edge at its base being = 140°. A combination quoted by Phillips is similar to Fig. 92. having the oblique edges between *b* and *b* replaced by the faces of a pyramid, the base of which is = 122° 50′. H.

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Combinations. 1. P — ∞. P + ∞. P̆r + ∞. 2. P — ∞. P + ∞. P̆r + ∞. P̄r + ∞. Nagyag, Transylvania.

Cleavage, P — ∞, very perfect. Fracture not observable. Surface, P — ∞ smooth.

Lustre metallic. Colour blackish lead-grey. Streak unchanged.

Highly flexible in thin laminæ. Very sectile. Hardness = 1·0 ... 1·5. Sp. Gr. = 7·085.

Compound Varieties. Massive: composition granular, of various sizes of individuals, sometimes longish.

OBSERVATIONS.

1. According to KLAPROTH, the prismatic Tellurium-glance consists of

Tellurium	32·20.
Lead	54·00.
Gold	9·00.
Silver	0·50.
Copper	1·30.
Sulphur	3·00.

Before the blowpipe it melts easily upon charcoal, emits white fumes, which are deposited upon the charcoal, and gives a malleable metallic globule. With borax it gives a bead of gold containing a little silver. It is easily soluble in nitric acid.

2. It has been hitherto found only in veins with hexahedral Gold, hexahedral Glance-blende, dodecahedral Garnet-blende, macrotypous Parachrose-baryte, &c.

3. Its chief locality is Nagyag in Transylvania, from whence it obtained its ancient name of *Nagiaker-Erz*. It is found also with prismatic Antimony-glance, at Offenbanya in the same country.

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Genus V. MOLYBDENA-GLANCE.

1. RHOMBOHEDRAL MOLYBDENA-GLANCE.

Rhomboidal Molybdena. Jam. Syst. Vol. III. p. 372. Man. p. 282. Sulphuret of Molybdena. Phill. p. 248. Wasserblei. Wern. Hoffm. H. B. IV. 1. S. 231. Wasserblei. Hausm. I. S. 197. Molybdänglanz. Leonh. S. 162. Molybdène sulfuré. Haüy. Traité, T. IV. p. 289. Tabl. comp. p. 114. Traité, 2de Ed. T. IV. p. 326.

Fundamental form. Rhombohedron, of unknown dimensions. Vol. I. Fig. 7.

Simple forms. $R - x$; P; $P + \infty$. They occur in combination with each other, and seem to possess a di-rhombohedral character.

Cleavage, $R - \infty$, highly perfect. Fracture not observable. Surface, $R - \infty$ smooth; P and $P + \infty$ horizontally streaked.

Lustre metallic. Colour pure lead-grey. Streak unchanged.

Thin laminæ are highly flexible. Very sectile. Hardness = 1·0 ... 1·5. Sp. Gr. = 4·591.

Compound Varieties. Massive: composition granular, of various sizes of individuals.

OBSERVATIONS.

1. According to Bucholz, rhombohedral Molybdena-glance consists of

Molybdena	60·00.
Sulphur	40·00.

It does not melt, nor is it reduced before the blowpipe, but it emits sulphureous fumes, which are deposited on the charcoal. It deflagrates with nitre, and is soluble with effervescence in nitric acid, leaving a grey residue.

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2. It is generally found imbedded in several rocks, particularly in granite, and is not unfrequently met with in several repositories of pyramidal Tin-ore. Besides this species, it is most commonly accompanied by rhombohedral Quartz and prismatic Scheelium-ore.

3. Among the oldest known localities of the present species are Altenberg in Saxony, and Schlaggenwald and Zinnwald in Bohemia. As in these places, it occurs also in Cornwall, along with pyramidal Tin-ore. In Norway and Sweden it occurs imbedded in zircon-syenite and granite; in granite also at Carrock in Cumberland, and in Westmoreland in England, at Loch Creran in Scotland, &c. It is frequent in the granite and gneiss of the United States of North America, and has been found also in the valley of Chamouni in Savoy, and in Silesia.

Genus VI. BISMUTH-GLANCE.

1. PRISMATIC BISMUTH-GLANCE.

Prismatic Bismuth-Glance. Jam. Syst. Vol. III. p. 384. Man. p. 283. Sulphuret of Bismuth. Phill. p. 273. Wismuthglanz. Wern. Hoffm. H. B. IV. 1. S. 68. Wismuthglanz. Hausm. I. S. 190. Wismuthglanz. Leonh. S. 213. Bismuth sulfuré. Haüy. Traité, T. IV. p. 190. Tabl. comp. p. 105. Traité, 2de Ed. T. IV. p. 210.

Fundamental form. Scalene four-sided pyramid of unknown dimensions. Vol. I. Fig. 9.

Simple forms and combinations not determined.

Cleavage, imperfect in the direction of $P + \infty$, which is nearly equal to 90°; with great perfection parallel to one of the diagonals, less distinctly parallel to the other; $P - \infty$ imperfect. Fracture scarcely observable. Surface of the prisms deeply streaked parallel to the axis.

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Lustre metallic. Colour lead-grey, inclining a little to steel-grey. Streak unchanged.

Rather sectile. Hardness = 2·0 ... 2·5. Sp. Gr. = 6·549, the variety from Rezbanya.

Compound Varieties. Massive: composition granular, the individuals being of various sizes; or columnar, individuals straight and aggregated in various directions.

OBSERVATIONS.

1. According to SAGE it consists of

Bismuth	60·00.
Sulphur	40·00.

According to this analysis it is $Bi\ S^6$, which corresponds to 59·51 of bismuth, and 40·49 of sulphur. It is volatilised before the blowpipe, and covers the charcoal with a yellow areola. It is easily fusible, and emits continually small drops in a state of incandescence. It is easily soluble in nitric acid, and the solution yields a white precipitate on being further diluted.

2. Prismatic Bismuth-glance occurs principally in veins, but is found also in beds. It is generally associated with octahedral Bismuth, also with several species of Pyrites, with pyramidal Tin-ore, rhombohedral Quartz, &c.

3. It is rather a rare mineral. It is found at Altenberg, at Schneeberg, and some other places in Saxony, at Joachimsthal in Bohemia, at Rezbanya in Upper Hungary, in the latter place in beds; near Redruth and Botallack in Cornwall; at Riddarhyttan in Sweden, with uncleavable Cerium-ore; in the mountains of Beresof in Siberia, &c. Very fine varieties, in large cleavable individuals, are found at Carrock in Cumberland.

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GENUS VII. ANTIMONY-GLANCE.

1. PRISMATIC ANTIMONY-GLANCE.

Graphic Gold-Glance or Graphic Tellurium. JAM. Syst. Vol. III. p. 377. Prismatic Antimony-Glance. Man. p. 284. Graphic Tellurium. Graphic Gold. PHILL. p. 327. Schrifterz. WERN. Hoffm. H. B. IV. 1. S. 129. Schrifttellur. HAUSM. I. S. 130. Schrift-Tellur. LEONH. S. 183. Tellure natif aurifère et argentifère. HAÜY. Traité, T. IV. p. 326. Tellure natif auro-argentifère. Tabl. comp. p. 119. Traité, 2de Ed. T. IV. p. 380.

Fundamental form. Scalene four-sided pyramid. Vol. I. Fig. 9.

Simple forms. $P - \infty$ (*k*); P (*P*); $\frac{3}{4} P + 2$ (*b*); $(\breve{P}r)^3$ (*z*); $(\breve{P}r)^5$ (*a*); $(\breve{P}r + \infty)^3$ (*d*); $\breve{P}r$ (*o*); $\breve{P}r + \infty$ (*r*); $\breve{P}r + \infty$ (*s*).

Char. of Comb. Prismatic.

Combinations. 1. $P - \infty$. $\breve{P}r$. P. $\breve{P}r + \infty$. $\bar{P}r + \infty$. 2. $P - \infty$. $\breve{P}r$. P. $(\bar{P}r)^3$. $(\breve{P}r)^5$. $\frac{5}{4} P + 2$. $(\breve{P}r + \infty)^3$. $\breve{P}r + \infty$. $\bar{P}r + \infty$. Fig. 35.

Cleavage, $\breve{P}r + \infty$, highly perfect; $\bar{P}r + \infty$ perfect though not so easily obtained. Fracture uneven. Surface, $\bar{P}r + \infty$ vertically streaked; $\breve{P}r + \infty$ fused like; the remaining faces smooth.

Lustre metallic. Colour pure steel-grey. Streak unchanged.

Very sectile. Hardness = 1·5 ... 2·0. Sp. Gr. = 5·723, MÜLLER VON REICHENSTEIN.

Compound Varieties. Regular composition of acicular crystals nearly at angles of 60° and 120°, in one plane, frequently repeated and imparting to the whole the appearance of certain characters for

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writing. Massive: composition imperfectly columnar or granular, small but not impalpable.

OBSERVATIONS.

1. It is possible that the crystal represented in Fig. 35. is not a simple one, but compound parallel to the plane *r*, in which case the combinations might be hemi-prismatic. The angle *dd* over *s* is = 85° 40′, over *r* = 94° 20′ very nearly, the inclination of *o* on *r* about 125°. The present species presents a great many different varieties of crystalline forms, which being generally very much engaged among each other, and moreover modified by regular composition, have not yet been satisfactorily developed.*

2. According to KLAPROTH, it consists of

Tellurium	60·00.
Gold	30·00.
Silver	10·00.

It is remarkable, that the specific gravity of such a composition should be so low as has been stated above, it being much less than that of tellurium itself. By calculation the specific gravity is found above 10·0, which agrees pretty well with that of the Yellow Tellurium, as given by MÜLLER VON REICHENSTEIN, but this cannot refer to the same species, the specific gravity of which is given above. The prismatic Antimony-glance melts easily into a grey globule, which fumes and covers the charcoal with a white oxide. After having continued the blast for some time, a ductile metallic globule is obtained. It is soluble in nitric acid.

3. The prismatic Antimony-glance occurs at Offenbanya in Transylvania, in very narrow, but quite regular veins›

* It is difficult to trace the identity of the series of crystallisation in Fig. 35. with the figure given by Mr PHILLIPS, unless one of them be discovered to have been in fact a compound crystal. The inclination of c^3 on c^3 over *M* follows = 94° 30′, nearly the same as *d* on *d* over *r*, and *M* on *h* is given = 126° 8′, perhaps a more accurate measurement than that indicated above by approximation = 125°. H.

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which traverse porphyry, several of them at a short distance from each other and parallel. It is accompanied by hexahedral Gold and rhombohedral Quartz, rarely by prismatic Tellurium-glance. It is occasionally met with along with the latter, at Nagyag in Transylvania.

4. It is a valuable ore, on account of its contents of gold and silver.

2. PRISMATOIDAL ANTIMONY-GLANCE.

Prismatic Antimony-Glance or Grey Antimony. JAM. Syst. Vol. III. p. 390. Man. p. 285. Grey Antimony. Sulphuret of Antimony. PHILL. p. 329. Grauspiesglaserz. WERN. Hoffm. H. B. IV. 1. S. 102. Grauspiessglanzerz. HAUSM. I. S. 194. Antimonglanz. S. 152. Antimoine sulfuré. HAÜY. Traité, T. IV. p. 264. Tabl. comp. p. 112. Traité, 2de Ed. T. IV. p. 291.

Fundamental form. Scalene four-sided pyramid. P = 109° 16′, 108° 10′, 110° 59′. Vol. I. Fig. 9. R. G.

$$a : b : c = 1 : \sqrt{0{\cdot}9577} : \sqrt{0{\cdot}9327}.$$

Simple forms. $\frac{4}{5}$ P — 2 (*s*); P (*P*); P + ∞ (*m*) = 90° 45′; ($\frac{4}{3}$ P̆r — 2)^5 (*e*); ($\frac{4}{3}$ P̆r — 2)^7 (*b*); P̆r — 1 (*a*) = 127° 51′; P̆r + ∞ (*o*).

Char. of Comb. Prismatic.

Combinations. 1. $\frac{4}{3}$ P — 2. P + ∞. P̆r + ∞.

2. P. P + ∞. P̆r + ∞. Both similar to Fig. 6.

3. P. ($\frac{4}{3}$ P̆r — 2)^7. P + ∞. P̆r + ∞.

4. $\frac{4}{3}$ P — 2. P̆r — 1. ($\frac{4}{3}$ P̆r — 2)^5. P. ($\frac{4}{3}$ P̆r — 2)^7. P + ∞. P̆r + ∞. Fig. 32.

All of them from Felsöbanya, Hungary.

Cleavage, highly perfect in the direction of P̆r + ∞; less distinct P — ∞, P + ∞ and P̄r + ∞, sometimes pretty easily obtained. Fracture small conchoidal, rather imperfect. Surface, the ver-

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tical planes deeply striated parallel to their own intersections, and rough. The pyramids in a parallel position with P are sometimes irregularly streaked in a horizontal direction, but generally smooth, as also the other inclined faces. Subject to tarnish.

Lustre metallic. Colour lead-grey, inclining to steel-grey. Streak unchanged.

Sectile. Thin laminæ are a little flexible parallel to the intersection of $\breve{P}r + \infty$ with $P - \infty$. Crystals sometimes bent. Hardness = 2·0. Sp. Gr. = 4·620 the cleavable variety from Anhalt.

Compound Varieties. Massive: composition columnar, of various sizes of individuals, sometimes very thin, but not impalpable. They are long and straight, either parallel or divergent from several common centres, and aggregated in a second angulo-granular composition. The faces of composition are irregularly streaked in a longitudinal direction. Sometimes the composition is granular, and then the individuals often become impalpable, but are generally very strongly connected; the fracture becomes even or uneven. Capillary crystals often form a tissue resembling wool or felt.

OBSERVATIONS.

1. The present species has been divided into *Common* and *Plumose Grey Antimony*, differing chiefly in the size of their individuals. The latter consists of capillary crystals, which are sometimes even flexible, and either implanted in groupes, or interlaced with each other; sometimes also they form massive varieties in which the columnar composition

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is very delicate. The common Grey Antimony has been farther subdivided into *radiated*, *foliated*, and *compact*. The first contains the crystals and massive varieties with a columnar composition, the second only granular compositions, in which the individuals can still be distinguished; and the third those in which the composition is impalpable.

2. According to PROUST and THOMSON, the prismatoidal Antimony-glance consists of

Antimony	75·00	73·77.
Sulphur	25·00	26·23.

Its chemical formula is $Sb\,S^3$, corresponding to 72·77 of antimony, and 27·23 sulphur. It is very fusible before the blowpipe, and is absorbed by the charcoal. By a continued blast it may be volatilised without leaving any considerable residue.

3. The greater part of the varieties of prismatoidal Antimony-glance are found in veins, which in some instances almost exclusively consist of this species. Yet it occurs also in beds, particularly with brachytypous Parachrose-baryte, and beds seem almost always to be the repositories of the compact varieties. Frequently it is associated with prismatic Hal-baryte, often with prismatic Purple-blende, and commonly also with rhombohedral Quartz. It occurs besides along with various other species of the orders Glance, Blende, and Haloide, with prismatic Antimony-baryte, and not unfrequently with hexahedral Gold. Its decomposition produces the *Antimony-ochre*, a friable or compact yellow substance, with which it is often associated or covered.

4. Veins consisting almost entirely of the present species have been discovered at Pösing near Pressburg in Hungary, and at Wolfsthal in the county of Stollberg in the Hartz; such as contain considerable quantities of it associated with other minerals, at Felsöbanya in Upper Hungary, at Cremnitz, Schemnitz, and other places in Lower Hungary, and in France, from whence beautiful varieties are obtained. It occurs also in Scotland, in Cornwall, at Bräunsdorf near Freiberg in Saxony, and at Neudorf in

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Anhalt. The fibrous variety occurs at Loben in the valley of the Lavant in Carinthia, in beds of brachytypous Parachrose-baryte, and the compact one particularly at Magurka in Hungary.

5. It is used for extracting the crude antimony, or the metal itself, which is employed in the manufacture of several metallic alloys, and in medicine.

3. AXOTOMOUS ANTIMONY-GLANCE.

Prismatoidal Antimony-Glance, or Grey Antimony (in part). JAM. Syst. Vol. III. p. 390. Man. p. 285.

Fundamental form. Scalene four-sided pyramid. Vol. I. Fig. 9.

Simple forms. $P + \infty = 101°20'$ (nearly); $\breve{P}r + \infty$.

Combinations, of the preceding forms, their terminations not observed.

Cleavage, $P - \infty$ highly perfect; less distinct, though easily observed, when the crystals are not too small, $P + \infty$ and $\breve{P}r + \infty$. Fracture not observable.

Lustre metallic. Colour steel-grey. Streak unchanged.

Sectile. Hardness = 2·0 ... 2·5. Sp. Gr. = 5·564.

Compound Varieties. Massive: composition columnar, individuals generally very delicate; straight and parallel, or divergent.

OBSERVATIONS.

1. Nothing as yet is known of the proportions among the ingredients of the present species. It contains sulphur, antimony, and lead.

2. The axotomous Antimony-glance seems to be a rare mineral, or at least not sufficiently attended to by mine-

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ralogists. It occurs in masses of considerable dimensions in Cornwall, sometimes along with the di-prismatic Copper-glance. In Hungary it is engaged in rhombohedral Lime-haloide, but its locality is not exactly known.

Genus VIII. MELANE*-GLANCE.

1. PRISMATIC MELANE-GLANCE.

Rhomboidal Silver-Glance or Brittle Silver-Glance. Jam. Syst. Vol. III. p. 345. Prismatic Melane-Glance. Man. p. 287. Brittle Sulphuret of Silver. Phill. p. 390. Sprödglaserz. Wern. Hoffm. H. B. III. 2. S. 63. Sprödglanzerz. Hausm. I. S. 138. Schwarz-giltigerz. Leonh. S. 202. Argent noir. Haüy. Traité, T. III. p. 416. Argent antimonié sulfuré noir. Tabl. comp. p. 76. Traité, 2de Ed. T. III. p. 280.

Fundamental form. Scalene four-sided pyramid. P = 130° 16′, 104° 19′, 96° 7′. Vol. I. Fig. 9. R. G.

$$a : b : c = 1 : \sqrt{2{\cdot}526} : \sqrt{1{\cdot}187}.$$

Simple forms. P — ∞; P (*P*); P + ∞ = 111° 8′; (P̆r)^3 (*a*); (P̆r + ∞)^3 (*d*) = 72° 13′; (P̄r + ∞)^5 = 142° 10′; (P̄r)^5; P̆r (*o*) = 115° 39′; P̆r + ∞ (*p*); P̄r + ∞ (*s*).

Char. of Comb. Prismatic.

1. P̆r. P̆r + ∞. P̄r + ∞. Alte Hoffnung mine, Freiberg
2. P. (P̆r + ∞)^3. P̄r + ∞. Fig. 7. Alte Hoffnung mine.
3. P̆r. P. (P̄r)^5. (P̆r + ∞)^3. P̆r + ∞. P̄r + ∞. Fig. 30. Przibram, Bohemia.
4. P — ∞. P̆r. P. (P̄r)^5. (P̄r)^5. P + ∞.

* From μέλας, black.

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$(\breve{P}r + \infty)^3$. $(\bar{P}r + \infty)^5$. $\breve{P}r + \infty$. $\bar{P}r + \infty$. Morgenstern mine, Freiberg.

Cleavage, $(\breve{P}r + \infty)^3$ and $\breve{P}r + \infty$, imperfect and interrupted. Fracture conchoidal, uneven. Surface, $\breve{P}r$ and $\breve{P}r + \infty$ generally streaked parallel to their edges of combination with each other; the other forms smooth.

Lustre metallic. Colour iron-black. Streak unchanged.

Sectile. Hardness = 2·0 ... 2·5. Sp. Gr. = 6·269, a crystal from Przibram.

Compound Varieties. Twin-crystals: face of composition parallel, axis of revolution perpendicular to a face of $\breve{P}r$; the composition is frequently repeated, either in parallel layers, or contiguous to several parts of the same individual. Thence compound masses arise, consisting of alternating laminæ of two or more individuals, as in prismatic Lime-haloide, di-prismatic Lead-baryte, &c., with the forms of which those of the present species agree in a remarkable manner. Massive: composition granular, individuals strongly connected; fracture uneven.

OBSERVATIONS.

1. According to KLAPROTH, it consists of

Silver	66·50.
Antimony	10·00.
Iron	5·00.
Sulphur	12·00.
Copper and Arsenic	0·50.

BERZELIUS could not discover any antimony by the blow-

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pipe, and is therefore of opinion that it is a compound of sulphur, arsenic, and silver. Before the blowpipe, upon charcoal, it yields a dark coloured metallic globule, which may be reduced either with soda and silica, or with saltpetre. It is soluble in dilute nitric acid.

2. The prismatic Melane-glance is found in silver veins along with other ores of silver, also with hexahedral Lead-glance, dodecahedral Garnet-blende, and several species of the orders Pyrites, Haloide, and Baryte. It is sometimes associated with native Arsenic and hexahedral Gold. Prismatic Melane-glance in compact varieties is often intimately mixed with hexahedral Lead-glance, and with prismatoidal Antimony-glance, a mixture designated by the name of *White Silver*, the *Weissgiltigerz* of the Wernerian system. The richer it is in silver, the more it approaches in its properties to the pure varieties of the present species, while in the contrary cases it yields more nearly the characters of compact hexahedral Lead-glance and compact prismatoidal Antimony-glance, or of a mixture of both, and differs from them perhaps only in the colour. It is evident that the White Silver does not deserve to be ranked as a particular species, on account of this mode of formation, and the variable proportions of the species entering into the mixture. It is found in silver veins in Saxony.

3. The prismatic Melane-glance occurs chiefly in Saxony, Bohemia, and Hungary; in the last of which countries it is called *Röschgewächs*. Its chief localities in Saxony are the mining districts of Freiberg, Schneeberg, and Johanngeorgenstadt, in Bohemia those of Przibram and Ratieborzitz, and in Hungary those of Schemnitz and Cremnitz. It is found also at Joachimsthal in Bohemia; at Andreasberg in the Hartz, here only in small quantities; at Zacatecas in Mexico, and in Peru.

4. On account of its considerable contents of silver, it is a valuable ore for the extraction of that metal.

5. The two following minerals must here be noticed, as they seem to be nearly allied to the prismatic Melane-glance.

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i. *Flexible Sulphuret of Silver.*

Flexible Sulphuret of Silver. PHILL. p. 289. Argent sulfuré flexible. BOURNON. Cat. p. 209.

Hemi-prismatic. A crystal is given by Mr PHILLIPS, observed and measured by Mr BROOKE. It nearly resembles Fig. 172., but is flattened between P and P, having the edges between M and T replaced by one plane e, and those between l and P by two planes, d^2 and d^1. Angles, M on $T = 125°$, e on $T = 159°$, l on $l = 121°$, d^2 on $d^2 = 83° 30'$, d^1 on $d^1 = 48°$, k on $k = 126° 40'$, s on $s = 90°$.

Cleavage perfect, parallel to P.

Lustre metallic. Colour dark externally, nearly black. Streak shining, but less so than hexahedral Silver-glance.

Thin laminæ flexible. Yields readily to the knife.

It consists, according to the experiments of Dr WOLLASTON, of silver, sulphur, and a little iron. This mineral was first discovered by Count BOURNON, who suspects Hungary to be the locality of the specimens he examined.

ii. *Sulphuret of Silver and Antimony.*

Sulphuret of Silver and Antimony. PHILL. p. 290. Mine d'argent grise antimoniale. ROMÉ DE L'ISLE. Vol. III. p. 54.

Prismatic. Combinations similar to Fig. 23., without h, and having several other prisms (g^1, g^2, g^3) contiguous to its obtuse edge, which in the figure is that between two adjacent faces of M. Inclination, according to PHILLIPS, of x on $x = 130° 8'$, P on $P = 60° 56'$, s on $s = 57° 45'$, M on M (adjacent) $= 100°$, g^1 on $g^1 = 119° 40'$, g^2 on $g^2 = 139°$, g^3 on $g^3 = 167°$.

Cleavage, easy parallel to M and in other directions. Surface striated in a longitudinal direction.

Lustre metallic. Colour approaching to silver white.

Yields easily to the knife. Sp. Gr. = 5·5.

Before the blowpipe it gives out copious white vapours and a slight sulphureous odour, leaving behind a white metallic globule. It is supposed to consist chiefly of antimony,

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sulphur, and silver. The locality quoted of this mineral is the mine of Himmelsfürst near Freiberg. It had first been distinguished by ROMÉ DE L'ISLE; Mr FREIESLEBEN had given it the name of *Schilfglaserz*, but it was only of late more accurately described by Mr PHILLIPS.

ORDER XII. BLENDE.

GENUS I. GLANCE-BLENDE.

1. HEXAHEDRAL GLANCE-BLENDE.

Prismatic Manganese-Blende. JAM. Syst. Vol. III. p. 406. Man. p. 288. Sulphuret of Manganese. PHILL. p. 246. Manganblende. BREITH. Hoffm. H. B. IV. 2. S. 197. Schwarzerz. HAUSM. I. S. 199. Manganglanz. LEONH. S. 370. Manganèse sulfuré. HAÜY. Tabl. comp. p. 111. Traité, 2de Ed. T. IV. p. 268.

Fundamental form. Hexahedron. Vol. I. Fig. 1.
Simple forms. H; O, Vol. I. Fig. 2.
Combinations. 1. H. O. Vol. I. Fig. 3. and 4.
Cleavage, hexahedron, perfect; traces of the dodecahedron. Fracture uneven, imperfect conchoidal. Surface rough.
Lustre imperfect metallic. Colour iron-black. Streak dark-green. Opake.
Rather sectile. Hardness = 3·5 ... 4·0. Sp. Gr. = 4·014, a cleavable variety.

Compound Varieties. Massive: composition granular, of various sizes of individuals; faces of composition irregularly streaked or rough.

OBSERVATIONS.

1. According to KLAPROTH and VAUQUELIN, the hexahedral Glance-blende consists of

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Protoxide of Manganese	82·00	85·00.
Sulphur	11·00	15·00.
Carbonic Acid	5·00	0·00.

It is generally, however, considered as a sulphuret of manganese. Before the blowpipe it is melted with difficulty, and only on its thinnest edges. It emits sulphuretted hydrogen, if reduced to powder and thrown into nitric, muriatic, or dilute sulphuric acid, and is dissolved.

2. It is a rare mineral. It occurs chiefly in veins along with prismatic Tellurium-glance, at Nagyag in Transylvania. According to PHILLIPS, it is found also in Cornwall.

GENUS II. GARNET-BLENDE.

1. DODECAHEDRAL GARNET-BLENDE.

Dodecahedral Zinc-Blende. JAM. Syst. Vol. III. p. 410. Man. p. 288. Blende. Sulphuret of Zinc. PHILL. p. 351. Blende. WERN. Hoffm. H. B. IV. 1. S. 73. Blende. HAUSM. 1. S. 229. Blende. LEONH. S. 309. Zinc sulfuré. HAÜY. Traité, T. IV. p. 167. Tabl. comp. p. 103. Traité, 2de Ed. T. IV. p. 186.

Fundamental form. Hexahedron. Vol. I. Fig. 1.

Simple forms. $\overset{*}{H}$ (*s*) Cornwall; $\frac{O}{2}$ (*g*) Vol. I. Fig. 13.; — $\frac{O}{2}$ (*g*) Vol. I. Fig. 14.; D (*P*) Vol. I. Fig. 31.; $\frac{B}{2}$ Vol. I. Fig. 17.; — $\frac{C_2}{2}$ (*y*) Vol. I. Fig. 16.

Char. of Comb. Semi-tessular, with inclined faces.

Combinations. 1. $\frac{O}{2}\cdot$ — $\frac{O}{2}\cdot$ Fig. 158. Cornwall.

2. $\frac{O}{2}\cdot$ — $\frac{C_2}{2}\cdot$ Vol. I. Fig. 78, the faces *r* considerably enlarged, so as to intersect each other. Junge hohe Birke mine near Freiberg.

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3. D. $-\frac{C_2}{2}$. Fig. 162. Alston Moor, Cumberland.

4. $\frac{O}{2}$. $-\frac{O}{2}$. D. $\frac{B}{2}$. Kapnik, Transylvania.

5. H. $\frac{O}{2}$. D. $-\frac{C_2}{2}$. Alston Moor.

Cleavage, dodecahedron highly perfect. Fracture conchoidal. Surface, the tetrahedrons and the two tetragonal dodecahedrons generally, though faintly streaked parallel to their common intersections; the trigonal dodecahedron is often uneven or curved, but at the same time smooth and shining.

Lustre adamantine. Colour green, yellow, red, brown, black, none of them bright. Streak white ... reddish-brown, corresponding to the colour. Transparent ... translucent.

Brittle. Hardness = 3·5 ... 4·0. Sp. Gr. = 4·078, a cleavable variety; = 4·027, a columnar, compound variety.

Compound Varieties. Twin-crystals: face of composition parallel, axis of revolution perpendicular to a face of the octahedron. Fig. 156. and 163. This composition is often repeated, either in parallel layers, or in the direction of several faces of the octahedron. Reniform and other imitative shapes: surface rough; composition columnar, often almost impalpable; straight, divergent, and frequently producing a second curved lamellar, or granular composition. Massive: composition columnar or granu-

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lar, sometimes impalpable, often very distinct. The fracture of impalpable compositions is uneven or even.

OBSERVATIONS.

1. Although the subspecies distinguished among the varieties of the species *Blende* have been denominated after their colours, yet they do not depend entirely or solely upon these colours. The colours of *yellow Blende* are green, yellow, or pale reddish-brown; its varieties possess the highest degrees of transparency which occur in the species. The red and brown colours of the *brown Blende* are darker, and its degrees of transparency lower than in the preceding subspecies. The varieties of *black Blende* are either black and opake, or they are blood-red. Brown Blende has been farther subdivided into *foliated*, *radiated*, and *fibrous* brown Blende. Simple varieties and compound ones, consisting of granular individuals, are contained in the first of these divisions; columnar compositions, in which the individuals are still discernible, in the second; and very thin columnar or impalpable compositions originating from them, which assume various imitative shapes, are comprehended in the third division. In the columnar compositions the individuals often present in the cross fracture the even faces of regular composition parallel to a face of the octahedron. Three of the faces of cleavage may be easily obtained parallel to the axis, and produce with the above mentioned faces of composition a regular six-sided prism. On account of the great facility with which the faces of composition may be obtained, it is more difficult to observe the inclined faces of cleavage, which nevertheless are very distinct, and produce with the vertical ones the dodecahedron, as the real form of cleavage of the species. The exact distinction of the Wernerian subspecies of yellow, brown, and black Blende, requires a great deal of practice, and can be acquired only empirically, and even then many varieties will occur that render the distinction impossible. This is a sure though empirical demonstration that the distinction itself is useless.

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2. According to THOMSON and GUENIVEAU, it consists of

Zinc	59·09	62·00.
Iron	12·05	1·50.
Sulphur	28·86	34·00.

Its chemical formula is $Zn\,S^2$, agreeing with 66·72 of zinc and 33·28 of sulphur. When strongly heated in the oxidating flame of the blowpipe, it gives off vapours of zinc, which form a coating on the charcoal, but it does not melt. It is soluble in nitric acid, during which process sulphuretted hydrogen is disengaged.

3. Dodecahedral Garnet-blende is frequently found in nature; but all its varieties are not equally common. It is met with in beds and veins, accompanied chiefly by hexahedral Lead-glance, several species of Iron-pyrites, Arsenical-pyrites, Copper-pyrites, several Haloides, Barytes, &c., in beds also by dodecahedral Garnet, octahedral Iron-ore, and several species of Augite-spar. It is not rare in rich silver veins, and is associated with native Silver, and the different ores of that metal.

4. Yellow Blende principally occurs in fine varieties at Schemnitz in Lower Hungary, and at Kapnik in Transylvania; also at Scharfenberg, Schwarzenberg, and Rittersgrün in Saxony, at Ratieborzitz in Bohemia, at Gummerud in Norway, and other places. Brown Blende is found at Freiberg, and other localities in Saxony, in Bohemia, Hungary, and Transylvania, in the Hartz, at Sahla in Sweden, in great quantities in Derbyshire and Cumberland; also in Cornwall in England. The radiated variety in particular is found at Przibram; it is that variety which contains the greatest proportion of cadmium. The chief localities of fibrous Blende are Raibel in Carinthia, Geroldseck in Swabia, and Wheal Unity in Cornwall; of black Blende, Freiberg, Annaberg, Breitenbrunn, and Schwarzenberg in Saxony, and many places in Bohemia, Hungary, Transylvania, Silesia, in the Hartz and other countries.

5. The application of dodecahedral Garnet-blende for the extraction of zinc, is as yet very limited.

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Genus III. PURPLE-BLENDE.

1. PRISMATIC PURPLE-BLENDE.

Prismatic Antimony-Blende or Red Antimony. Jam. Syst. Vol. III. p. 421. Man. p. 290. Red Antimony. Phill. p. 331. Rothspiesglaserz. Wern. Hoffm. H. B. IV. 1. S. 114. Rothspiessglanzerz. Hausm. I. S. 225. Antimonblende. Leonh. S. 157. Antimoine hydro-sulfuré. Haüy. Traité, T. IV. p. 276. Antimoine oxydé sulfuré. Tabl. comp. p. 113. Traité, 2de Ed. T. IV. p. 311.

Fundamental form. Scalene four-sided pyramid. Inclination of the axis = 11° 19′ in the plane of the long diagonal. Vol. I. Fig. 41. Ap.

$$a : b : c : d = 5{\cdot}0 : 3{\cdot}1 : c : 1.$$

Simple forms. $P - \infty$; $\frac{\breve{P}r + 1}{2} = 15° 47'$; $- \frac{\breve{P}r}{2} = 34° 6'$; $\breve{P}r + \infty$. The faces of all the forms hitherto observed, are parallel to one of the diagonals of P, and this is supposed to be the short diagonal.

Char. of Comb. Hemi-prismatic. Inclination of $P - \infty$ on $\breve{P}r + \infty = 101° 19'$.

Combinations. 1. $- \frac{\breve{P}r}{2}$. $\breve{P}r + \infty$. 2. $P - \infty$. $- \frac{\breve{P}r}{2}$. $\breve{P}r + \infty$. 3. $P - \infty$. $\frac{\breve{P}r + 1}{2}$. $- \frac{\breve{P}r}{2}$. $\breve{P}r + \infty$. All of them are elongated, and often appear only as thin filaments parallel to the short diagonal; the termination of the crystals in that direction has not been observed.

Cleavage. $\breve{P}r + \infty$ highly perfect; less distinct $\breve{P}r + \infty$; there are traces in other directions perhaps of $P + \infty$. Fracture not observable.

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Surface more or less deeply streaked parallel to the edges of combination.

Lustre common or metallic adamantine. Colour cherry-red. Streak cherry-red or brownish-red. Feebly translucent.

Sectile. Thin laminæ are slightly flexible. Hardness = 1·0 ... 1·5. Sp. Gr. = 4·5 ... 4·6.

Compound Varieties. Tufts of capillary crystals. Massive: composition very thin columnar, straight and divergent from common centres.

OBSERVATIONS.

1. The division of Red Antimony in the system of WERNER is similar to that of the Grey Antimony. *Common Red Antimony* forms the first, and *Tinder-Ore* the second subspecies. The Tinder-Ore comprises those varieties which, originally consisting of short capillary individuals, interlaced with each other, appear in flakes resembling tinder, while the Common Red Antimony refers to crystals, and to those compound varieties, in which the columnar individuals are still discernible.

2. According to KLAPROTH, the prismatic Purple-blende consists of

Antimony	67·50.
Oxygen	10·80.
Sulphur	19·70.

Alone before the blowpipe it melts easily upon charcoal, by which it is absorbed, and at last entirely volatilised. Immersed in nitric acid, it is covered with a white coating.

3. It is almost always accompanied by prismatoidal Antimony-glance, which has induced some mineralogists to believe it to have been produced from a decomposition of that species. It occurs in veins; besides the above mentioned species, it is accompanied by prismatic Antimony-baryte, rhombohedral Quartz, &c.

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4. The varieties of this species occur at Bräunsdorf near Freiberg in Saxony, at Malazka near Pösing in Hungary, and at Allemont in Dauphiny in France. The principal localities of Tinder-ore are Clausthal and Andreasberg in the Hartz.

Genus IV. RUBY-BLENDE.

1. RHOMBOHEDRAL RUBY-BLENDE.

Rhomboidal Ruby-blende or Red Silver. Jam. Syst. Vol. III. p. 425. Man. p. 291. Red Silver. Ruby Silver. Phill. p. 291. Rothgiltigerz. Wern. Hoffm. H. B. III. 2. S. 67. Rothgiltigerz. Hausm. I. S. 221. Rothgültigerz. Leonh. S. 199. Argent antimonié sulfuré. Haüy. Traité, T. III. p. 402. Tabl. comp. p. 75. Traite, 2de Ed. T. III. p. 269.

Fundamental form. Rhombohedron. R = 108° 18′. Vol. I. Fig. 7. R. G.

$$a = \sqrt{1{\cdot}895}.$$

Simple forms. R — ∞ (*o*); R — 2 (*s*) = 157° 40′; R — 1 (*z*) = 137° 39′; R (*P*); R + 1 (*g*, *i*) = 80° 59′; R + ∞ (*k*); P + ∞ (*n*); $(P-2)^5$ (*t*); $(P-1)^5$ (*a*); $(\frac{5}{4}P-1)^3$ (*b*); $(P)^3$ (*h*); $(P)^5$; $(P+1)^3$.

Char. of Comb. Rhombohedral. Sometimes the configuration of the opposite apices is different. Of the faces of R + ∞ often only the alternating ones appear, as in rhombohedral Tourmaline.

Combinations. 1. R — 1. P + ∞. R + 1. R — 1. Fig. 182. Andreasberg, Hartz.*

2. R—1. $\frac{R+\infty}{2}$. P + ∞. Fig. 136. Andreasberg.

* In the cabinet of Mr Allan. H.

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3. $(\frac{5}{4}\,P - 1)^3$. $(P)^3$. $P + \infty$. Saxony.
4. $R - 2$. $R - 1$. $(P)^3$. $P + \infty$. Beschertglück, Saxony.
5. $R - 1$. $(P - 2)^3$. R. $P + \infty$. Joachimsthal, Bohemia.
6. $R + 1$. $(P)^3$. $R + \infty$. $P + \infty$. Marienberg, Saxony.
7. $R - 1$. $R + 1$. $(P)^3$. $(P)^5$. $P + \infty$. Beschertglück.
8. $R - 1$. $(P - 2)^3$. R. $(P - 1)^3$. $(\frac{5}{4}\,P - 1)^3$. $(P)^3$. $P + \infty$. Fig. 126.

Cleavage, R, in several varieties pretty distinct, in others scarcely observable. Fracture conchoidal. Surface, $R - 2$ streaked parallel to the edges of combination with $R - 1$; $R - 1$, $(P - 2)^3$ and the pyramids belonging to R, also $P + \infty$ often striated parallel to their common edges of combination; $P + \infty$ is sometimes rough, as is also $(\frac{5}{4}\,P - 1)^3$.

Lustre common adamantine in light coloured varieties, metallic adamantine in dark coloured ones.

Colour iron-black ... cochineal-red. Streak several shades of cochineal-red, corresponding to the colour; in some varieties it is almost aurora-red. Semi-transparent ... opake.

Sectile. Hardness = 2·0 ... 2·5. Sp. Gr. = 5·846, crystals from Beschertglück.

Compound Varieties. Twin-crystals. 1. Face of composition perpendicular, axis of revolution parallel to an edge of $R - 1$. Fig. 139. This

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kind of regular composition is frequently repeated, contiguous to all the terminal edges of R — 1, as in Fig. 140., or still farther, since two new individuals may again be joined to every one of the former group. A great number of individuals are often joined in that manner. 2. Face of composition parallel, axis of revolution perpendicular to a face of R — 2. This mode of composition forms the supplement to the preceding one, but it is far less frequent. 3. Face of composition parallel to a face of R + ∞, axis of revolution perpendicular to it. If the individuals are continued beyond the face of composition, then the composition is parallel to all the faces of R + ∞. Massive: composition granular, of various sizes of individuals, strongly connected. If the composition becomes impalpable, fracture is uneven, even, or flat conchoidal. Plates, superficial coatings.

OBSERVATIONS.

1. The difference between the *Light* and *Dark Red Silver*, though originally founded on the different tints of colour and streak of the two minerals, and on their lustre, which is dependent upon them, is deeper rooted in the essence of these bodies than it would appear at first sight. The forms of the Light Red Silver have not yet been ascertained with sufficient exactness; they do not seem, however, to be very different from those of the Dark Red Silver, and also the peculiarities in their crystallisations are common to both. There is no difference in their hardness. The specific gravity of the two substances, however, is considerably different, being circumscribed, as far as our present information goes, within the limits of 5·8 ... 5·9

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for the dark red, and of 5·4 ... 5·6 for the light red variety. A dark red cleavable variety from the Hartz gave 5·831, a light red one, also cleavable, from Annaberg, 5·524, and a crystallised one from the Churprinz mine near Freiberg, having the colour of the dark red variety, 5·422. This subject deserves the particular attention of mineralogists, though as yet it is impossible to settle any thing in regard to the determination of the species. The colours of the Dark Red Silver are dark cochineal-red passing into iron-black, its streak is more or less deep cochineal-red, and it is opake or but faintly translucent on the edges. The colours of Light Red Silver are more distinctly cochineal-red, but approach in some varieties to those of Dark Red Silver; its streak is light cochineal-red, and often almost aurora-red; it is translucent on the edges, and frequently semi-transparent. In these properties, however, the two varieties are joined by transitions.

2. The rhombohedral Ruby-blende consists, according to BONSDORF, of

Silver	58·949.
Antimony	22·846.
Sulphur	16·609.
Earthy substances	0·299.

He gives for its chemical formula 3 Ag S^2 + 2 Sb S^3, which corresponds to 58·98 of silver, 23·47 antimony, and 17·55 of sulphur. It decrepitates before the blowpipe upon charcoal, melts and emits fumes of sulphur and antimony, after which it yields a globule of silver. It is soluble in dilute nitric acid.

3. The rhombohedral Ruby-blende has been hitherto always found in veins, associated with various other ores of silver, with hexahedral Silver, hexahedral Lead-glance, dodecahedral Garnet-blende, and several species of Pyrites: the light red varieties often with native Arsenic, prismatic Iron-pyrites, octahedral Cobalt-pyrites, and other species.

4. Rhombohedral Ruby-blende is confined to a small number of localities, but in some of these it occurs in pret-

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ty considerable quantities. It is found in many of the veins near Freiberg, also at Marienberg, Annaberg, Schneeberg, and Johanngeorgenstadt in Saxony; likewise at Joachimsthal, Przibram, and other places in Bohemia. The light red varieties are more generally met with in the districts of the Saxon and Bohemian mines, nearer the highest ridge of mountains, while the dark red occur in greater proportion in the neighbourhood of Freiberg, and in other places of the lower districts. The dark red silver is found in beautiful crystals at Andreasberg in the Hartz. It is met with also at Schemnitz, Cremnitz, Nagybanya, &c. in Hungary, in Alsace and Dauphiny in France, at Kongsberg in Norway. Some other countries produce but a small quantity of it, as, for instance, Cornwall; but it is very abundant in Mexico and Peru.

5. It is a valuable mineral for the extraction of silver. It has been observed that the dark red yields a greater quantity of silver than the light red variety.

2. HEMI-PRISMATIC RUBY-BLENDE.

One of the varieties commonly comprised among the Dark Red Silver.

Fundamental form. Scalene four-sided pyramid. $P = \left\{\begin{matrix}128^\circ\ 59' \\ 121^\circ\ 1'\end{matrix}\right\}$, 130° 7′, 77° 16′. Inclination of the axis = 11° 6′, in the plane of the long diagonal. Vol. I. Fig. 41. Ap.

$$a : b : c : d = 5{\cdot}1 : 9{\cdot}5 : 8{\cdot}7 : 1.$$

Simple forms. $P - \infty$ (*b*); $\frac{P}{2} = 128^\circ 59'$; $P + \infty$ (*f*) = 86° 4′; $-\frac{(\breve{P}r)^3}{2}$; $-\frac{\breve{P}r + 1}{2}$ (*t*) = 47° 26′; $\frac{\frac{3}{4}\breve{P}r + 2}{2} = 28^\circ 9'$.

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Char. of Comb. Hemi-prismatic. Inclination of $P - \infty$ on $\breve{P}r + \infty = 101° 6'$.

Combination. 1. $P - \infty$. $-\frac{\breve{P}r + 1}{2}$. $P + \infty$. Fig. 183. There occur many secondary faces; the whole has much the appearance of crystals of hemi-prismatic Vitriol-salt.

Cleavage, $\frac{\frac{3}{4}\breve{P}r + 2}{2}$ and $\breve{P}r + \infty$, imperfect. Fracture imperfect conchoidal. Surface, deeply streaked parallel to the edges of combination with $\frac{\frac{3}{4}\breve{P}r + 2}{2}$, particularly $P - \infty$ and $P + \infty$, as indicated in the figure; the pyramids are smooth, $-\frac{\breve{P}r + 1}{2}$ rough, though even.

Lustre intermediate between metallic and metallic adamantine. Colour iron-black. Streak dark cherry-red. Opake, except in thin splinters, where it transmits a deep blood-red colour.

Very sectile. Hardness = 2·0 ... 2·5. Sp. Gr. = 5·234.

OBSERVATIONS.

1. The chemical composition of this species has not been as yet exactly ascertained. Before the blowpipe it gives results nearly agreeing with those of rhombohedral Ruby-blende, but it contains only about 35 ... 40 per cent. of silver, besides sulphur and antimony. The only specimen of it, in the possession of Mr Von Weissenbach at Freiberg, is supposed to have been found in the mine called Neue Hoffnung Gottes, at Bräunsdorf near Freiberg in

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Saxony. It consists only of crystals, and is not accompanied by any other mineral.*

3. PERITOMOUS RUBY-BLENDE.

Prismato-rhomboidal Ruby-blende or Cinnabar. JAM. Syst. Vol. III. p. 435. Man. p. 292 Cinnabar. Sulphuret of Mercury. PHILL. p. 358. Zinnober. Queck-silber-Lebererz. WERN. Hoffm. H. B. III. 2. S. 26. 33. Zinnober. Stinkzinnober. Lebererz. HAUSM. I. S. 213. 215. 216. Zinnober. LEONH. S. 187. Mercure sulfuré. HAÜY. Traité, T. III. p. 437. Tabl. comp. p. 78. Traité, 2de Ed. T. III. p. 313.

Fundamental form. Rhombohedron. R = 71° 47′. Vol. I. Fig. 7. HAUY.

a = √ 15·75.

Simple forms. R — ∞ (*o*); R — 2 (*u*) = 122° 35′; $\frac{4}{3}$ R — 2 (*z*) = 110° 6′; $\frac{4}{5}$ R — 1 (*k*) = 101° 59′; R — 1 (*a*) = 92° 36′; R (*P*); R + ∞ (*l*).

Char. of Comb. Rhombohedral.

Combinations. 1. R — ∞. R + ∞. Almaden, Spain.
2. R — ∞. R — 2. $\frac{4}{3}$R — 2. R. Idria, Carniola.
3. R — ∞. $\frac{4}{5}$ R — 2. R. R + ∞. Almaden.
4. R — ∞. R — 2. $\frac{4}{3}$R — 2. $\frac{4}{5}$R — 1. R — 1. R. R + ∞. Fig. 125. Almaden.

Cleavage, R + ∞, highly perfect. Fracture conchoidal. Surface, the rhombohedrons horizontally streaked, some of them very deeply.

Lustre adamantine, inclining to metallic in dark coloured varieties. Colour several shades of co-

* I must here mention a finely crystallised specimen in the possession of Mr BROOKE, which seems to have some properties analogous to the hemi-prismatic Ruby-blende. Yet its combinations appear to be tetarto-prismatic, and may therefore belong to another species. H.

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chineal-red, the darker varieties inclining to lead-grey. Streak scarlet-red. Semi-transparent ... translucent on the edges.

Sectile. Hardness = 2·0 ... 2·5. Sp. Gr. = 8·098, the cleavage variety from Neumarktel.

Compound Varieties. Twin-crystals: face of composition parallel, axis of revolution perpendicular to a face of R — ∞; the individuals frequently continued beyond the face of composition. Rarely in some indistinct imitative shapes. Massive: composition granular, of various sizes of individuals, generally small, and often impalpable. In the last case fracture becomes uneven, even, or flat conchoidal. Plates, superficial coatings. There is sometimes a tendency to thin columnar composition, the mass being friable, and the colour scarlet-red.

OBSERVATIONS.

1. *Cinnabar* and *Quicksilver Liver-Ore* or Hepatic Cinnabar, which formerly used to be distinguished as two different species, in fact do not differ more from each other than calcareous spar and compact limestone, or crystallised and compact hexahedral Lead-glance. The Quicksilver Liver-Ore is a compound variety of Cinnabar, sometimes impure, and having on that account a streak which is not perfectly scarlet-red, but inclines to brown. There is a farther subdivision of each of these two kinds of rhombohedral Ruby-blende. The *dark red* Cinnabar comprehends the crystals, and those compound varieties in which the individuals are still discernible; it is generally cochineal-red. The *bright red* Cinnabar is friable, and of a scarlet-red colour. The *compact* Quicksilver Liver-Ore contains uniform massive varieties of a granular composition, consisting of impalpable individuals. The *slaty* Quicksilver Liver-

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Ore is the same thing, only interrupted by irregularly streaked smooth faces, which possess a slaty appearance. These, however, are entirely accidental, and have no relation to the composition itself. These varieties, and the dark-red Cinnabar, are closely connected by transitions, as is always the case in well determined species. This is not so immediately the case in the bright red Cinnabar, perhaps because the latter seems to have undergone a kind of disintegration, as the traces of columnar composition which are often observable, indicate.

2. According to two analyses by KLAPROTH, it consists of

Mercury	84·50	85·00.
Sulphur	14·75	14·25.

Its chemical formula is $Hg\ S^2$, corresponding to 86·29 of mercury, and 13·71 of sulphur. The Quicksilver Liver-Ore contains small quantities of carbon, silica, oxide of iron, and other foreign admixtures. Before the blowpipe the pure varieties are entirely volatilised. It is soluble in nitric acid. It may be obtained in crystalline masses, shewing a columnar composition, on being sublimated.

3. Peritomous Ruby-blende chiefly occurs in beds, accompanied by fluid Mercury, and the rare species of dodecahedral Mercury and pyramidal Pearl-kerate, sometimes only by rhombohedral Lime-haloide and rhombohedral Quartz. Some of its varieties have also been found in veins, where they occur along with several ores of iron. It is found besides in small quantities in the beds of brachytypous Parachrose-baryte.

4. It occurs in beds in gneiss, at Reichenau in Upper Carinthia, and at Hartenstein in Saxony; also at Dumbrawa in Transylvania, in greywacke. Included in limestone in irregular beds, and in those veins of calcareous spar which traverse it in all directions, it is found at Hermagor, Windisch-Kappel, and other places in Carinthia, but particularly at Neumarktel in Carniola. Its most important repositories, however, are Idria in Carniola, the Palatinate,

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and Almaden in Spain. At Idria it occurs in beds of bituminous shale, with black Mineral-resin, and dark grey sandstone, associated with limestone. It seems that the repositories of Moschellandsberg, Wolfstein, and Almaden, are much of the same nature. The peritomous Ruby-blende is found in veins at Schemnitz, Cremnitz, and Rosenau in Hungary, at Horzowitz in Bohemia, and in the Erzberg near Eisenerz in Stiria. The Quicksilver Liver-Ore has been found only at Idria, the bright red Cinnabar at Wolfstein in the Palatinate. Peritomous Ruby-blende is found besides in considerable quantities in Mexico and Peru, in China, Japan, &c.; small quantities are met with in several countries.

5. It is used for the extraction of mercury; but only if very pure, it may be employed as a pigment in its natural state.

ORDER XIII. SULPHUR.

GENUS I. SULPHUR.

1. PRISMATOIDAL SULPHUR.

Yellow Orpiment or Prismatoidal Sulphur. JAM. Syst. Vol. III. p. 455. Prismatoidal Sulphur or Yellow Orpiment. Man. p. 293. Orpiment. PHILL. p. 277. Gelbes Rauschgelb. WERN. Hoffm. H. B. IV. 1. S. 220. Rauschgelb. HAUSM. I. S. 208. Auripigment. LEONH. S. 168. Arsenic sulfuré jaune. HAÜY. Traité, T. IV. p. 234. Tabl. comp. p. 109. Traite, 2de Ed. T. IV. p. 247.

Fundamental form. Scalene four-sided pyramid. P = 131° 36′, 94° 20′, 105° 6′. Vol. I. Fig. 7. Ap.

$$a : b : c :: 1 : \sqrt{0{\cdot}8} : \sqrt{2{\cdot}2}.$$

Simple forms. P (*P*); P + ∞ = 117° 49′; $(\breve{P}r)^3$; $(\breve{P}r + \infty)^3$ (*u*) = 79° 20′; $\bar{P}r$ (*o*) = 83° 37′; $\breve{P}r + \infty$ (*s*); $\bar{P}r + \infty$.

Char. of Comb. Prismatic.

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Combinations. 1. P. P + ∞. (P̆r + ∞)³. Sim. Fig. 36., without *n* and *x*.

2. P̄r. P. (P̆r + *x*)³. P̆r + ∞. Fig. 17.

3. P̄r. P. (P̆r)³. P + ∞. (P̆r + ∞)³. P̄r + ∞. All of them from Tajowa, Hungary.

Cleavage, P̆r + ∞, highly perfect; the faces of cleavage are streaked parallel to the edges of intersection with P̄r + ∞, parallel to which there are likewise some traces of cleavage. Fracture scarcely observable. Surface, P̆r + ∞, rough, but even; all the other faces are streaked parallel to their edges of combination with P̆r + ∞, and generally uneven.

Lustre metallic-pearly upon the perfect faces of cleavage, for the rest resinous. Colour several shades of lemon-yellow. Streak lemon-yellow, generally a little paler than the colour. Semi-transparent ... translucent on the edges.

Sectile. Thin laminæ are highly flexible. Hardness = 1·5 ... 2·0. Sp. Gr. = 3·480, a cleavable variety.

Compound Varieties. Reniform, botryoidal, and other imitative shapes: composition curved lamellar, faces of composition commonly rough. Massive: composition granular, of various sizes of individuals; faces of composition uneven, often irregularly streaked.

OBSERVATIONS.

1. *Orpiment* and *Realgar*, the prismatoidal and the hemi-prismatic Sulphur, are improperly united within one

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and the same species in most mineralogical works. Their specific difference is obvious in several of their properties, in the measures of their angles, the character of their combinations, and particularly in their cleavage. Eminent faces of cleavage, like those in the present species, never disappear altogether in simple varieties, and may be observed even in compound ones, though the particles of composition be nearly impalpable. But no trace of such a cleavage exists in the following species, and this circumstance will therefore always yield a sure and palpable, though not the only character for distinguishing Orpiment from Realgar.

2. According to KLAPROTH and LAUGIER, the prismatoidal Sulphur consists of

Sulphur 38·00	38·14.
Arsenic 62·00	61·86.

Its chemical formula As S^3 agrees with 39·08 of sulphur, and 60·92 of arsenic. Before the blowpipe upon charcoal it burns with a blue flame, and emits fumes of sulphur and arsenic. It is soluble in the nitric, muriatic, and sulphuric acids.

3. The prismatoidal Sulphur is found in imbedded nodules, more rarely in imbedded crystals in blue clay, and is accompanied by hemi-prismatic Sulphur. In this way it is met with at Tajowa near Neusohl in Lower Hungary, in the neighbourhood of Vienna, and probably also in Wallachia, Servia, and other countries. At Kapnik in Transylvania, and Felsöbanya in Upper Hungary, it occurs in metalliferous veins with several species of Pyrites, Blende, and Glance, with native Arsenic, and particularly with hemi-prismatic Sulphur. It is found likewise in Natolia, China, and Mexico.

5. It is used as a pigment.

2. HEMI-PRISMATIC SULPHUR.

Red Orpiment or Ruby Sulphur or Hemi-prismatic Sulphur. JAM. Syst. Vol. III. p. 451. Hemi-prismatic

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Sulphur, or Red Orpiment. Man. p. 294. Rothes Rauschgelb. WERN. Hoffm. H. B. IV. 1. S. 224. Realgar. HAUSM. I. S. 210. Realgar. LEONH. S. 166. Arsenic sulfuré rouge. HAÜY. Traité, T. IV. p. 228. Tabl. comp. p. 109. Traité, 2de Ed. T. IV. p. 247.

Fundamental form. Scalene four-sided pyramid. $P = \left\{\begin{matrix}130° & 1'\\ 131° & 59'\end{matrix}\right\}$, 142° 59′, 62° 44′. Inclination of the axis = 4° 1′ in the plane of the long diagonal. Vol. I. Fig. 41. AP.

a : b : c : d = 14·2 : 38·55 : 29·25 : 1.

Simple forms. $\pm\frac{P}{2}\left\{\begin{matrix}n\\ n'\end{matrix}\right\} = \left\{\begin{matrix}130° & 1'\\ 131° & 59'\end{matrix}\right\}$; $P + \infty$ (f); $\pm\frac{(\breve{P}r)^5}{2}\left\{\begin{matrix}q\\ q'\end{matrix}\right\} = \left\{\begin{matrix}94° & 2'\\ 96° & 36'\end{matrix}\right\}$; $-\frac{(\breve{P})^5}{2}$ (l); $(\breve{P}r + \infty)^3$ $(g) = 113° 20'$; $(\breve{P}r + \infty)^7$ $(w) = 90° 48'$; $(\breve{P} + \infty)^{\frac{5}{2}} = 124° 30'$; $(\bar{P}r + \infty)^5$ $(v) = 53° 56'$; $\pm\frac{\breve{P}r}{2}\left\{\begin{matrix}x\\ P\end{matrix}\right\} = \left\{\begin{matrix}73° & 18'\\ 66° & 44'\end{matrix}\right\}$; $\frac{\frac{5}{4}\breve{P}r + 2}{2} = 43° 52'$; $\breve{P}r + \infty$ (s); $\bar{P}r + \infty$ (u).

Char. of Comb. Hemi-prismatic. Inclination of $P - \infty$ on $\breve{P}r + \infty = 85° 59'$.

Combinations. 1. $-\frac{\breve{P}r}{2}$. $P + \infty$. Sim. Fig. 44., reversed.

2. $-\frac{\breve{P}r}{2}$. $-\frac{P}{2}$. $P + \infty$. $(\breve{P}r + \infty)^3$. Fig. 48.

3. $\frac{\breve{P}r}{2}$. $\frac{P}{2}$. $\frac{(\bar{P}r)^3}{2}$. $-\frac{\breve{P}r}{2}$. $-\frac{P}{2}$. $-\frac{(\bar{P}r)^3}{2}$. $-\frac{(\breve{P})^3}{2}$. $P + \infty$. $(\breve{P}r + \infty)^5$. $(\breve{P}r + \infty)^3$.

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$(\breve{P}r + \infty)^5$. $\breve{P}r + \infty$. $\bar{P}r + \infty$. Fig. 184.
All of them from Nagyag, Transylvania.

Cleavage, $-\frac{\breve{P}r}{2}$ and $\bar{P}r + \infty$ rather perfect; less distinct $\frac{P}{2}$, $P + \infty$ and $\breve{P}r + \infty$; traces of $(\breve{P}r + \infty)^5$; all of them much interrupted. Fracture perfect conchoidal. Surface, the prisms in the direction of the principal axis streaked parallel to that line; the inclined faces often rough, particularly $-\frac{P}{2}$, and almost always $\frac{\breve{P}r}{2}$ and $\frac{\frac{3}{4}\breve{P}r + 2}{2}$; $-\frac{\breve{P}r}{2}$ is sometimes streaked parallel to the edges of combination with $-\frac{P}{2}$.

Lustre resinous. Colour, aurora-red, several shades, little differing from each other. Streak orange-yellow ... aurora-red.

Sectile. Hardness = 1·5 ... 2·0. Sp. Gr. = 3·556, a semi-transparent crystal.

Compound Varieties. Massive: composition granular, of various sizes of individuals, strongly connected. Fracture conchoidal, uneven.

OBSERVATIONS.

1. According to KLAPROTH and LAUGIER, hemi-prismatic Sulphur consists of

Sulphur 31·00	30·43.
Arsenic 69·00	69·57.

Its chemical formula is $As\,S^2$, which requires 29·96 of sul-

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phur, and 70·04 of arsenic. It gives the same re-actions as the preceding species.

2. Some of the varieties of hemi-prismatic Sulphur occur along with the prismatoidal one, in beds of clay, as at Tajowa in Hungary. It is found in small nodules, along with tetrahedral Copper-glance and hexahedral Iron-pyrites, engaged in dolomite, a granular variety of macrotypous Lime-haloide, at St Gothard in Switzerland. More generally it is met with in metalliferous veins, particularly with ores of silver and lead, with native Arsenic, several species of Pyrites, of Baryte, and Haloide, &c. The chief localities are Kapnik and Nagyag in Transylvania, Felsöbanya in Upper Hungary, Joachimsthal in Bohemia, Schneeberg in Saxony, Andreasberg in the Hartz, and many other places. Hemi-prismatic Sulphur is found in Peru, in the United States of North America, and along with the preceding species in the vicinity of several active volcanoes.

4. The hemi-prismatic Sulphur, like the preceding species, is used as a pigment.

3. PRISMATIC SULPHUR.

Prismatic Sulphur. JAM. Syst. Vol. III. p. 459. Man. p. 295. Sulphur. PHILL. p. 360. Natürlicher Schwefel. WERN. Hoffm. H. B. III. 1. S. 252. Schwefel. HAUSM. I. S. 61. Schwefel. LEONH. S. 109. Soufre. HAÜY. Traité, T. III. p. 277. Tabl. comp. p. 68. Traité, 2de Ed. T. IV. p. 407.
MITSCHERLICH. Ann. de Chimie. Vol. XXIV. p. 264.

Fundamental form. Scalene four-sided pyramid. P = 106° 38′, 84° 58′, 143° 17′. Vol. I. Fig. 7. MITSCHERLICH.

$$a : b : c = 1 : \sqrt{0{\cdot}2776} : \sqrt{0{\cdot}1824}.$$

Simple forms. P — ∞ (*r*); $\frac{4}{5}$ P — 2 = 142° 4′, 133° 3′, 62° 9′; $\frac{4}{5}$ P — 2 (*s*) = 127° 1′, 113° 11′, 90° 15′; $\overset{*}{\mathrm{P}}$ (*P*), Conil, Spain; P + ∞ (*m*) =

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101° 59′; $\breve{P}r$ (n) = 55° 36′; $\bar{P}r$ = 46° 15′; $\bar{P}r + \infty$ (o).

Char. of Comb. Prismatic.

Combinations. 1. P — ∞. P.

2. P — ∞. $\frac{4}{3}$P — 2. $\breve{P}r$. P. P + ∞. Fig. 18. Sicily.

3. P — ∞. $\frac{4}{5}$P — 2. $\frac{4}{3}$P — 2. $\breve{P}r$. $\bar{P}r$. P. P + ∞. Artern, Thuringia.

Cleavage, P and P + ∞, imperfect, difficultly obtained, and interrupted. Fracture conchoidal, sometimes highly perfect. Surface, $\breve{P}r$ commonly rough, the rest of the faces generally smooth and shining, possessing nearly the same physical quality.

Lustre resinous. Colour, several shades of sulphur-yellow, inclining sometimes to red or green. Streak sulphur-yellow, passing into white. Transparent ... translucent on the edges.

Sectile. Hardness = 1·5 ... 2·5. Sp. Gr. = 2·072, crystals from Spain.

Compound Varieties. Twin-crystals: axis of revolution perpendicular, face of composition parallel to a face of $\bar{P}r$.* Imbedded globules: surface uneven; composition impalpable, often impure. Massive: composition granular, often impalpable, strongly coherent; fracture uneven, even, flat conchoidal. Sometimes pulverulent.

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* This kind of regular composition has been observed by Dr G. Rose. H.

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OBSERVATIONS.

1. The usual division of the present species into *common* and *volcanic* Sulphur depends upon the geological situation of their natural repositories. The second kind is a product of sublimation; it appears in the shape of crusts, superficial coatings, stalactites, or also in loose mealy masses; and consists generally of columnar particles of composition, not unfrequently terminating in crystalline points. It occurs sometimes also in very considerable crystals. Common Sulphur has been farther subdivided into *compact* and *earthy*, the last of which comprehends those varieties which, on account of the smallness of the individuals in the granular compositions, appear as a friable mealy powder.

2. The prismatic Sulphur is the pure sulphur as it occurs in nature, occasionally mixed with bitumen or clay. It acquires resinous electricity by friction, is easily inflammable, and burns with a blue or white flame, and a pungent smell of sulphurous acid. It is insoluble in water, but unites readily with potash or soda. It may be obtained crystallised by sublimation, or still more easily from solutions in liquids. Professor MITSCHERLICH has shewn, that the forms of sulphur, crystallised from fusion, are incompatible with those of the present species. They are hemi-prismatic, being generally oblique rhombic prisms of 90° 32′, the terminal face of which is inclined to the obtuse edge of the prism, which is itself commonly replaced, at an angle of 95° 46′; a horizontal prism in the direction of the short diagonal measures 99° 18′. It occurs almost always in regular compositions. The crystals are at first transparent, but they soon become opake. It has not yet been observed in nature.

3. The prismatic Sulphur is principally met with in beds of prismatoidal Gypsum-haloide, or in the accompanying strata of clay. It is generally associated with rhombohedral Lime-haloide, and often also with prismatoidal Hal-baryte. In veins it occurs with pyramidal Copper-pyrites, hexahedral Lead-glance, hemi-prismatic Sulphur,

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&c. It is deposited from several springs, and in large quantities from volcanoes. Sometimes it occurs in beds of bituminous Mineral-coal.

4. Prismatic Sulphur is found in splendid crystals, and pure massive varieties, also in globular concretions, which, however, are seldom without earthy or bituminous admixtures, in Sicily, and several provinces of Italy. It occurs in imbedded spheroidal masses of a brown colour, which is owing to bitumen, at Radoboy near Crapina in Croatia. Near Cracovia in Poland it is likewise met with in more or less pure massive varieties and small crystals. The finest crystals, besides Sicily, are known from Conil near Cadiz in Spain. Small crystals have been observed investing the brown coal from Artern in Thuringia. In veins it occurs in Swabia, in Spain, and in Transylvania. The earthy Sulphur is found in Poland, in Moravia, and other countries, the volcanic Sulphur in Iceland, near Vesuvius, in the Solfatara, in fine crystals in Teneriffe, in great profusion near the volcanoes of Java, and in the vicinity of most other active volcanoes. Prismatic Sulphur occurs besides in Savoy, in Piedmont, in Switzerland, at Lauenstein in Hanover, in South America, and many other countries.

5. Prismatic Sulphur requires to be purified, either by melting or by sublimation, for rendering it fit to be an object of commerce. It is used in the manufacture of gunpowder, of cinnabar, of several pharmaceutical preparations, of sulphuric acid, and various other articles.

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CLASS III.

RESIN. COAL.

Order I. RESIN.

Genus I. MELICHRONE*-RESIN.

1. PYRAMIDAL MELICHRONE-RESIN.

Pyramidal Honeystone. Jam. Syst. Vol. III. p. 467. Pyramidal Mellilite or Honeystone. Man. p. 296. Mellite. Phill. p. 374. Honigstein. Wern. Hoffm. H. B. III. 1. S. 334. Honigstein. Hausm. III. S. 811. Honigstein. Leonh. S. 648. Mellite. Haüy. Traité, T. III. p. 335. Tabl. comp. p. 72. Traité, 2de Ed. T. IV. p. 445.

Fundamental form. Isosceles four-sided pyramid. P = 118° 4′, 93° 22′. Vol. I. Fig. 8. Haüy.

$$a = \sqrt{1{\cdot}125}.$$

Simple forms. P — ∞ (*o*); P — 1 (*t*) = 130° 55′, 73° 44′; $\overset{*}{P}$ (*P*); [P + ∞] (*g*).

Char. of Comb. Pyramidal.

Combinations. 1. P — ∞. P. Sim. Fig. 92. 2. P. [P + ∞]. 3. P — ∞. P — 1. P. [P + ∞]. Fig. 105. All of them from Artern.

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* From μελίχρους, having the colour of honey.

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Cleavage, P, very difficult. Fracture conchoidal. Surface, P — ∞ rough and curved, P — 1 rough, P and [P + ∞] smooth and shining.

Lustre resinous, inclining to vitreous. Colour honey-yellow, inclining often to red or brown. Streak white. Transparent ...translucent.

Sectile. Hardness = 2·0...2·5. Sp. Gr. = 1·597.

Compound Varieties. Small massive nodules: composition granular.

OBSERVATIONS.

1. According to KLAPROTH, the present species consists of

Alumina	16·00.
Mellitic Acid	46·00.
Water	33·00.

It loses colour and transparency, when exposed to the flame of a candle, and is soluble in nitric acid.

2. It does not frequently occur in nature, as there is only one well authenticated locality of it, Artern in Thuringia, where it is found in a bed of brown coal, which is nearly earthy, sometimes accompanied by small crystals of prismatic Sulphur. It has been quoted from Switzerland.

GENUS II. MINERAL-RESIN.

1. YELLOW MINERAL-RESIN.

Yellow Mineral Resin or Amber. JAM. Syst. Vol. III. p. 470. Man. p. 297. Amber. PHILL. p. 373. Bernstein. WERN. Hoffm. H. B. III. 1. S. 324. Börnstein. HAUSM. I. S. 92. Bernstein. LEONH. S. 664. Succin. HAÜY. Traité, T. III. p. 327. Tabl. comp. p. 71. Traité, 2de Ed. T. IV. p. 473.

Irregular forms, grains and spheroidal masses.

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Cleavage none. Fracture conchoidal. Surface uneven and rough.

Lustre resinous. Colour yellow prevalent, passing into red, brown, and white. Streak white. Transparent ... translucent.

Not very brittle. Hardness = 2·0 ... 2·5. Sp. Gr. = 1·081, a honey-yellow variety. Resinous electricity produced by friction.

OBSERVATIONS.

1. Two subspecies have been distinguished in *Amber*, according to their lustre and transparency. *Yellow* Amber contains yellow and red varieties, possessing the highest degrees of transparency to be met with in the species, while *white* Amber refers to white and pale yellow faintly translucent varieties. Often, however, both kinds are joined in one and the same specimen, and pass insensibly into each other, which demonstrates their identity.

2. According to DRAPPIER, it consists of

Carbon	80·59.
Hydrogen	7·31.
Oxygen	6·73.
Lime	1·54.
Alumina	1·10.
Silica	0·63.

It burns with a yellow flame, giving out an agreeable odour, and leaves a carbonaceous residue. It is soluble in alcohol.

3. The yellow Mineral-resin no doubt derives its origin from the vegetable kingdom. This receives an additional evidence by the insects and other organic bodies which it includes. It is found in beds of bituminous wood, from which it is disengaged by the action of the waves on the sea coast, and then thrown out or taken with nets.

4. The greatest quantity of the present species is obtained on the Prussian coasts of the Baltic, also on the coasts of Courland, Livonia, Pomerania, and Denmark. But it

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has been found also, generally engaged in bituminous wood, in Sicily, in Spain, near Paris in France, in Greenland, in China, and other countries.

5. It is cut into various ornaments and works of art, it enters the composition of certain kinds of varnish, and serves for fumigation. Considerable value is attached to large specimens which are transparent.

2. BLACK MINERAL-RESIN.

Black Mineral Resin. JAM. Syst. Vol. III. p. 481. Man. p. 298. Mineral Oil. Bitumen. Mineral Pitch. PHILL. p. 366. 368. Erdöl. Erdpech. WERN. Hoffm. H. B. III. 1. S. 266. 270. IV. 2. S. 137. Bergpech. Elaterit. Bergtheer. Naphtha. HAUSM. I. S. 85. 87. 88. 89. Erdöl. Elaterit. Asphalt. LEONH. S. 678. 680. 681. Bitume. HAÜY. Traité, T. III. p. 310. Tabl. comp. p. 70. Traité, 2de Ed. T. IV. p. 452.

Aggregation solid, or fluid, and all the intermediate stages. No regular form. Stalactitic shapes: surface smooth. Massive.

Fracture conchoidal, more or less perfect, uneven.

Lustre resinous. Colour black prevalent, but passing also into various brown and red tints. Fluid varieties are sometimes perfectly colourless. Streak commonly unchanged, sometimes lighter than the colour. Translucent on the edges, opake; some fluid varieties are transparent.

Sectile, malleable, elastic. Bituminous odour. Hardness = 0·0 ... 2·0. Sp. Gr. = 0·828, brown, malleable; = 1·073, black, slaggy; 1·160, hyacinth-red, slaggy.

OBSERVATIONS.

1. *Mineral Oil* and *Mineral Pitch*, generally considered as two distinct species, are included in the black Mineral-

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resin, as they scarcely differ in any thing but in their state of aggregation, which, however, from the perfectly fluid to the solid varieties, forms an uninterrupted series. The mineral oil is first inspissated, and then it is changed into mineral pitch by exposure to the air. Mineral pitch has been divided into *elastic*, *earthy*, and *slaggy*. The first is distinguished by its elasticity, which, however, it loses on exposure to the air, the fracture of the second is earthy, that of the third more or less perfectly conchoidal, and corresponding to the degrees of lustre it possesses. All these varieties are joined by transitions.

2. The fluid variety of the present species, called *Naphtha*, consists, according to THOMSON and SAUSSURE, of

Carbon	82·20	87·60.
Hydrogen	14·80	12·78.

Mineral oil is easily inflammable, and burns with a white flame and much smoke. Also the mineral pitch is very inflammable, and burns with a bituminous smell; some varieties melt in a higher temperature.

3. The fluid varieties of the present species ooze out of several rocks, as sandstone, slaty clay, &c., or they are found on the surface of springs and other waters. The elastic varieties occur only in the repositories of hexahedral Lead-glance in limestone rocks; the earthy ones in beds associated with limestone, and probably included in some of the coal formations. The slaggy varieties are often included in nodules in limestone, in agate balls, in veins, with hexahedral Lead-glance, octahedral Fluor-haloide, &c.; also in beds. It is met with on the shores and in the waters of the Dead Sea.

4. Fluid varieties have been found in various districts of Italy, in Sicily, in Zante, in the Caspian Sea, in Persia, and other countries in Asia; also, though in smaller quantities, in Westphalia and Alsace. Elastic mineral pitch, sometimes called *Mineral Caoutchouk*, has been hitherto found only at Castleton in Derbyshire. Earthy mineral pitch is found near Neufchatel in Switzerland, at Grund in the Hartz, in Dalmatia, &c.; the slaggy varieties occur

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forming nodules in limestone at Bleiberg in Carinthia, imbedded in sandstone in Albania, in great profusion in the island of Trinidad. It is found in veins in the Iberg near Grund in the Hartz, in Derbyshire, and other places.

5. The different varieties of the present species allow of considerable application for illuminating, for fuel, in fireworks, in the manufacture of varnish, of black sealing-wax, and for other purposes.

ORDER II. COAL.

GENUS I. MINERAL-COAL.

1. BITUMINOUS MINERAL-COAL.

Brown Coal (excepting Alum-Earth). Black Coal. JAM. Syst. Vol. III. p. 495. 507. Bituminous Mineral Coal (excepting Alum-Earth). Man. p. 301. Black Coal. Common Coal. Cannel Coal. Jet. Brown Coal. PHILL. p. 370. 371. 372. Braunkohle (excepting Alaunerde). Schwarzkohle (excepting Stangenkohle). WERN. Hoffm. H. B. III. 1. S. 277. 291. Schwarzkohle. Braunkohle. HAUSM. I. S. 73. 77. Pechkohle. Blätterkohle. Kannelkohle. Grobkohle. Russkohle. Braunkohle. Bituminöses Holz. Moorkohle. Erdkohle. Papierkohle. LEONH. S. 669. 670. 671. 672. 673. 675. 676. 677. Houille. Jayet. HAÜY. Traité, T. III. p. 316. 324. Houille (excepting H. bacillaire). Jayet. Tabl. comp. p. 71. Traité, 2de Ed. T. IV. p. 459. 470.

No regular form or structure. Fracture conchoidal, uneven.

Lustre resinous, more or less distinct. Colour, black or brown, passing in earthy varieties into greyish tints. Streak unchanged, except that it sometimes becomes shining. Opake.

Sectile, in different degrees. Hardness = 1·0...2·5. Sp. Gr. = 1·223, moor-coal from Teplitz; = 1·270, common brown coal from Eibiswald in

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Stiria; = 1·271, black coal from Newcastle; = 1·288, bituminous wood; 1·329, common brown coal from Leoben in Stiria; 1·423, cannel coal from Wigan in Lancashire.

Compound Varieties. Massive: composition lamellar, faces of composition smooth and even, different gradations; granular texture, often impalpable, and then fracture is uneven, even, or flat conchoidal. Ligniform shapes, the structure of which resembles that of wood, sometimes very distinct, but often obliterated, with the exception of some slight traces. Fracture then becomes conchoidal, particularly across the fibres. There are some earthy varieties of a loose friable texture.

OBSERVATIONS.

1. In the present species of bituminous Mineral-coal are comprised the *Brown Coal* and the *Black Coal* of WERNER, excepting the columnar coal, which must be referred to the following species. These two kinds, however, and still more so the varieties which they contain, are very difficult to be ascertained. Colour, structure, and the kind of lustre which depends upon the latter, are almost all that remain for their distinction. The colour of *Brown Coal*, as the name imports, is brown; it possesses a ligneous structure, or consists of earthy particles; the colour of *Black Coal* is black, not inclining to brown, and it does not possess the structure of wood. The varieties of Brown Coal are the following: *Bituminous Wood*, which presents a ligneous texture, and very seldom any thing like conchoidal fracture, imperfect, and without lustre; *Earthy Coal*, consisting of loose friable particles; *Moor Coal*, or *Trapezoidal Brown Coal*, distinguished by the want of ligneous structure, by the property of bursting and splitting into angular

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fragments, when removed from its original repository, and the low degree of lustre upon its imperfect conchoidal fracture; *Common Brown Coal*, which, though it still shews traces of ligneous texture, is of a more firm consistency than the rest of the varieties, and possesses higher degrees of lustre upon its more perfect conchoidal fracture. Some varieties of Black coal immediately join those of Brown coal. They are: *Pitch Coal*, of a velvet-black colour, generally inclining to brown, strong lustre, and presenting in every direction large and perfect conchoidal fracture. *Slate Coal* possesses a more or less coarse slaty structure, which, however, seems to be rather a kind of lamellar composition, than real fracture. *Foliated Coal* is similarly compound, only the laminæ are thinner, and *Coarse Coal* has a composition resembling it, only the component particles are smaller, and approach to a granular appearance. *Cannel Coal* is without visible composition, and has a flat conchoidal fracture in every direction, with but little lustre, by which it is distinguished from Pitch-coal. It is most like the Moor coal, but the difference in their specific gravity is greater than between almost any other two varieties of coal. All these kinds are joined by numerous transitions, so that it often becomes doubtful to which of them we should ascribe certain specimens, though they undoubtedly are bituminous Mineral-coal.

2. The preceding varieties of coal consist of bitumen and carbon in various proportions. They are more or less easily inflammable, and burn with flame and a bituminous smell. Several varieties become soft, and others coak, when kindled. They leave a more or less considerable earthy residue.

3. The varieties called slate coal, foliated coal, coarse coal, cannel coal, and pitch coal, occur chiefly in the coal formation; some varieties of pitch-coal, also the moor-coal, bituminous wood and common brown coal, are met with in the formations above the chalk; the earthy coal, and some varieties of bituminous wood and common brown coal, are often included in diluvial and alluvial detritus. The coal

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seams alternate with beds of slaty clay and common clay, sandstone, limestone, sand, &c. They are often associated with vegetable organic remains, in slaty clay, sometimes also with shells. Generally there is some hexahedral or prismatic Iron-pyrites intermixed along with them, and they are traversed by veins, generally narrow, of hexahedral Lead-glance.

4. The bituminous Mineral-coal is so universally distributed, that only a few localities can here be mentioned as examples. Bituminous wood is found in considerable quantity in Iceland, and is called *Surturbrand;* in the Meissner mountain in Hessia, in the Westerwald, at Voitsberg in Stiria, at Bovey in Devonshire. Earthy coal is found at Merseburg, Halle, Bernburg, at Eisleben in Thuringia. Moor coal occurs in the northern districts of Bohemia, as at Elbogen, Carlsbad, Teplitz, &c. also at Kaltennordheim. Common brown coal occurs in immense quantities on the river Sau, and on the foot of the Schwamberg Alps in Lower Stiria, at Judenburg, Leoben, and other places in Upper Stiria, in the Meissner in Hessia. Pitch coal is likewise found in the Meissner, at Planitz and Zwickau in Saxony, in Silesia, on the Rhine, in France; slaty coal at Potschappel in Saxony, in Silesia, in Westphalia, but particularly at Newcastle, Whitehaven, and other places in England and Scotland. Foliated coal is raised at Potschappel, at Löbegün near Halle on the Saale, also at Häring in the Tyrol, at Liege; coarse coal at Neustadt in the Hartz, at Potschappel in Saxony, in Silesia, &c.; and the cannel-coal particularly in Lancashire and Shropshire in England, and in Scotland.

5. The important use of the bituminous Mineral-coal is well known. The cannel-coal is worked into buttons, snuff-boxes, &c.

2. NON-BITUMINOUS MINERAL-COAL.

Glance Coal (excepting the first subsp.). JAM. Syst. Vol. III. p. 515. Man. p. 305. Mineral Carbon. Mineral Charcoal. Anthracite. Blind Coal. PHILL. p. 364. 365.

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Stangenkohle. Glanzkohle. WERN. Hoffm. H. B. III. 1. S. 295. 314. Anthrazit. HAUSM. I. S. 70. Kohlenblende. Glanzkohle. Stangenkohle. LEONH. S. 667. 668. 672. Anthracite. HAÜY. Traité, T. III. p. 307. Tabl. comp. p. 69. Traité, 2de Ed. T. IV. p. 440.

No regular form or structure. Fracture conchoidal, often perfect.

Lustre imperfect metallic. Colour iron-black, sometimes inclining to greyish-black. Streak unchanged. Opake.

Not very brittle. Hardness = 2·0 ... 2·5. Sp. Gr. = 1·400, columnar coal from Meissner; = 1·482, glance coal from Schönfeld, in Saxony.

Compound Varieties. Massive: composition lamellar, faces of composition either smooth and shining, or rough; generally impalpable, fracture conchoidal, more or less perfect. Some varieties are vesicular, others divided into columnar masses, meeting in rough faces.

OBSERVATIONS.

1. Besides Glance-Coal, the present species contains also the Columnar Coal, which in the Wernerian system is comprised in the species of Black Coal, to which, however, it does not belong. The *Columnar Coal* in particular is remarkable for its irregular columnar composition, which is probably produced by fissures, and the low degree of lustre in its fracture. Glance-coal has been divided into *Conchoidal* and *Slaty Glance-Coal*, the latter of which in particular is designated by the name of Anthracite. The first of them possesses a perfect conchoidal fracture, the second is compound like Slate Coal.

2. The varieties of the present species do not contain any bitumen, but consist wholly of carbon, occasionally mixed with variable proportions of oxide of iron, silica, and alu-

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mina. They are difficultly inflammable, and burn without smoke, flame, or bituminous smell, leaving a more or less considerable earthy residue.

3. The non-bituminous Mineral-coal is less frequent than the bituminous one. It very often occurs included in more ancient rocks; but some varieties are found in secondary strata. It is sometimes met with in veins traversing trap rocks.

4. The columnar coal is principally found on the Meissner in Hessia, along with the conchoidal Glance-coal, forming the uppermost division of a bed of bituminous wood, covered by basalt. It is said also to have been found in Dumfriesshire, and other districts of Scotland. Besides the Meissner, the conchoidal Glance-coal occurs at Schönfeld near Frauenstein in Saxony; in the neighbourhood of Spa; also in Ayrshire in Scotland, and in Staffordshire in England. The slaty Glance-coal is found in considerable quantity at Schönfeld; also at Lischwitz near Gera in Saxony, in Savoy, at Kongsberg in Norway, in the isle of Arran and other places in Scotland, as, for instance, in the trap rocks of the Calton hill near Edinburgh.

5. On account of its difficult inflammability, the employment of the non-bituminous Mineral-coal is less general than that of the bituminous one; yet it has been used for burning lime, in the process of refining iron, &c.

6. The *Mineral Charcoal* seems to be most nearly allied to the present species. It occurs in thin layers and massive specimens, of a very delicate columnar composition, and presenting on that account a kind of silky lustre. It is greyish-black or velvet-black, and inclosed in the varieties of bituminous Mineral-coal, particularly slate-coal and brown-coal. It occurs in many districts of Bohemia, Saxony, Silesia, England, &c. At Voitsberg in Stiria it is very plentiful in bituminous wood.

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APPENDIX I.

MINERALS, THE GREATER PART OF WHICH WILL PROBABLY FORM IN FUTURE DISTINCT SPECIES IN THE MINERAL SYSTEM.

ACMITE.

SPAR.

Achmite. STRÖM. Edinb. Phil. Journ. Vol. IX. p. 55.

Hemi-prismatic. Combination observed similar to Fig. 186.* Inclination of *M* on *M* over *r* = 86° 56′, angle abc = 28° 19′, MITSCHERLICH; *s* on *s* = 119° 30′, edge between *s* and *s* on *r* = 106°, AP. Twin-crystals compound parallel to *r*.

Cleavage, distinct parallel to *M*, also to *r* and *l* and *s*. Fracture imperfect conchoidal. Surface, *r* irregularly streaked in a longitudinal direction, the rest of the faces pretty even, but not very smooth.

Lustre vitreous. Colour brownish-black. Streak pale yellowish-grey. Opake, very thin edges are translucent, and shew a fine yellowish-brown tint.

Brittle. Hardness = 6·0 ... 6·5. Sp. Gr. = 3·24, STRÖM.

* In the cabinet of Mr ALLAN.

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It resembles paratomous Augite-spar in a remarkable degree, particularly in regard to form and regular composition. It has been found by BERZELIUS to consist of

Silica	55·25.
Oxide of Iron	31·25.
Oxide of Manganese	1·08.
Lime	0·72.
Soda	10·40.

It melts readily before the blowpipe, into a black globule.

It is found at Eger in Norway, imbedded in granite. Its name is derived from ἀκμή a point, from the form of the crystals.

ALLANITE.

ORE.

Allanite. THOMSON. Trans. Roy. Soc. Edinb. Vol. VI. p. 371. Prismatic Cerium-Ore or Allanite. JAM. Syst. Vol. III. p. 181. Man. p. 319. Allanite (in part). PHILL. p. 264.

Tetarto-prismatic. Combination observed similar to Fig. 185. Inclination of r on $M = 129°$, r on $P = 116°$, M on $P = 115°$; s on $r = 135\frac{1}{2}°$, d on $r = 124\frac{1}{2}°$, y on $r = 109°$, s on $x = 156\frac{3}{4}°$, x on $t = 164\frac{1}{2}°$, x on $y = 151°$, t on $y = 166\frac{1}{2}°$, AP.

Cleavage parallel to r and P indistinct. Fracture imperfect conchoidal.

Lustre imperfect metallic. Colour brownish- or greenish-black. Streak greenish-grey. Opake, faintly translucent in thin splinters, and brown.

Brittle. Hardness = 6·0. Sp. Gr. = 4·001, BOURNON.

Allanite froths before the blowpipe, and melts imperfectly into a black scoria. It gelatinises in nitric acid, and consists, according to Dr THOMSON, of

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Oxide of Cerium	33·90.
Oxide of Iron	25·40.
Silica	35·40.
Lime	9·20.
Alumina	4·10.

It was discovered at Alluk in East Greenland, by Sir CHARLES GIESECKE, and first observed by Mr ALLAN. It is accompanied by pyramidal Zircon, rhombohedral Quartz, &c.

ALLOPHANE.

Allophane. JAM. Syst. Vol. III. p. 531. Man. p. 181. Allophane. PHILL. p. 88.

Reniform, botryoidal, massive: composition impalpable. Fracture conchoidal.

Lustre vitreous, inclining to resinous. Colour blue, green, brown. Transparent ... translucent on the edges.

Hardness = 3·0 nearly. Sp. Gr. = 1·852 ... 1·889, STROMEYER.

Without addition it is infusible before the blowpipe. With borax it melts into a transparent, colourless glass. It consists, according to STROMEYER, of

Alumina	32·202.
Silica	21·922.
Lime	0·730.
Sulphate of Lime	0·517.
Carbonate of Copper	3·058.
Hydrate of Iron	2·270.
Water	41·301.

It is found at Saalfeld in Thuringia, in the mining district of Schneeberg in Saxony, and other places. It was first described by Professor STROMEYER.

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ALUMINITE.

Aluminite. JAM. Syst. Vol. II. p. 55. Man. p. 314. Aluminite. PHILL. p. 145.

Reniform, massive: composition impalpable. Surface dull. Fracture fine grained and earthy. Friable.

Colour white. Streak white, a little glimmering. It soils. Opake.

Sp. Gr. = 1·669, SCHREBER.

It is difficultly fusible. In acids it is readily dissolved, and does not effervesce. It imbibes water, but does not fall into pieces. According to STROMEYER, it consists of

	from Halle.	*from Newhaven.*
Alumina	30·262	29·868.
Sulphuric Acid	23·365	23·270.
Water	46·327	46·762.

It occurs at Halle on the Saale in Prussia, in beds of plastic clay, and also near Newhaven in Sussex in limestone.

AMBLYGONITE.

SPAR.

Amblygonite. JAM. Syst. Vol. III. p. 532. Man. p. 316. Amblygonite. PHILL. p. 198.

Prismatic. P + ∞ = 106° 10′. Cleavage, P + ∞. Fracture uneven.

Lustre vitreous, inclining to pearly. Colour greenish-white, passing into light mountain- and celandine-green. Streak white. Semi-transparent ... translucent.

Hardness = 6·0, BREITHAUPT. Sp. Gr. = 3·00 ... 3·04, BREITHAUPT.

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Before the blowpipe it is easily fusible, intumesces, and is converted into a white enamel. According to BERZELIUS, it consists of alumina, the phosphoric and fluoric acids, and lithia, in greater quantities than any other mineral.

It has hitherto been found only at Chursdorf near Penig in Saxony, where it occurs in granite, along with rhombohedral Tourmaline and prismatic Topaz. It was first discovered to be a particular species by Mr BREITHAUPT.

ANORTHITE.

FELD-SPAR.

Anorthit. G. ROSE. Gilberts Annalen der Physik. 1823. St. 2. p. 173.

Tetarto-prismatic. Simple forms and combinations, also the regular compositions exactly similar to those of Albite, p. 255., represented in Figs. 84–87. Dr ROSE gives the following measurements of the angles.

l on M	= 122° 2′.	y on P (over x)	= 98° 29′.
T on l	= 120° 30′.	P on M (over s)	= 85° 48′.
T on M	= 117° 28′.	P on M (opposite)	= 94° 12′.
P on T	= 110° 57′.	s on M	= 115° 20′.
x on P	= 128° 27′.	P on n	= 133° 13′.

Cleavage perfect parallel to P and M; none parallel to T. Fracture conchoidal. Surface of T more smooth than of l.

Lustre pearly upon cleavage planes, vitreous in other directions. Colour white. Streak white. Transparent ... translucent.

Brittle. Hardness = 6·0. Sp. Gr. = 2·763, massive; = 2·656 small crystals, apparently not entirely free from pyroxene. ROSE.

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According to Dr G. Rose, it consists of

Silica	44·49.
Alumina	34·46.
Oxide of Iron	0·74.
Lime	15·68.
Magnesia	5·26.

Before the blowpipe it comports itself nearly like prismatic Feld-spar, Albite, and Labradorite, only that with soda it does not give a clear glass. It is entirely decomposed by concentrated muriatic acid.

The only locality of Anorthite is Mount Vesuvius; it is found lining cavities in limestone, along with a green variety of paratomous Augite-spar.

APHRITE.

Aphrite. Jam. Syst. Vol. II. p. 543. Man. p. 48.
Aphrite. Phill. p. 150.

Prismatic. Cleavage monotomous, very distinct. Massive: composition granular, sometimes scaly, sometimes not coherent.

Lustre pearly upon the faces of cleavage. Colour white. Streak white. Opake.

Sectile. Feels fine, not greasy. Soils a little. Hardness = 0·5 ... 1·0. Sp. Gr. = 2·533.

It effervesces violently with nitric acid, and is completely dissolved. The friable varieties readily absorb water, during which they give a crackling noise. According to Bucholz, it consists of

Lime	51·500.
Silica	5·715.
Oxide of Iron	3·285.
Carbonic Acid	39·000.
Water	1·000.

It occurs at Rubiz near Gera in Saxony, upon the Meiss-

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ner in Hessia, and in several places in the county of Mansfeld. It is found in those varieties of secondary limestone, which have been called *Rauchwacke* and *Asche*, and is sometimes accompanied by, and intermixed with, prismatoidal Gypsum-haloide.

ARFVEDSONITE.

SPAR.

Arfvedsonite. BROOKE. Ann. of Phil. No. XXIX. p. 381. PHILL. p. 377.

Cleavage, a rhombic prism of 123° 55′, with brilliant faces.

Colour black. Sp. Gr. = 3·44, BROOKE.

It resembles hemi-prismatic Augite-spar, and is generally considered as a ferriferous variety of it. It accompanies the dodecahedral Kouphone-spar from Greenland, and black paratomous Augite-spar, with which it is grouped with parallel axes, in the same manner as amphibole and pyroxene in several varieties of diallage. It has not been analysed, but according to Mr CHILDREN (Ann. of Phil. XLIII. p. 37.), it melts easily into a black globule, if exposed in the platina forceps to the blast of the blowpipe. With borax it gives a glass coloured by iron; with salt of phosphorus likewise, but paler, and becoming colourless on cooling; a dark grey silica skeleton remains undissolved.

ARGENTIFEROUS COPPER-GLANCE.

GLANCE.

Argentiferous Copper-Glance. JAM. Syst. Vol. III. p. 551. Man. p. 321. Sulphuret of Silver and Copper. PHILL. p. 293.

Massive: composition impalpable.

Fracture flat conchoidal, even.

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Lustre metallic. Colour blackish lead-grey. Streak shining.

Perfectly sectile. Soft. Sp. Gr. = 6·255, STROMEYER.

Constituent parts, according to STROMEYER,

Silver	52·272.
Copper	30·478.
Iron	0·333.
Sulphur	15·782.

It occurs along with pyramidal Copper-pyrites, rhombohedral Lime-haloide and rhombohedral Quartz at Schlangenberg in Siberia, and is very rare. It was first described by Professors HAUSMANN and STROMEYER.

ARSENICAL BISMUTH.

Arsenik-Wismuth. WERN. Syst. S. 56.

Implanted globular shapes, massive: composition thin columnar, impalpable, also curved lamellar. Fracture imperfect conchoidal or uneven.

Lustre resinous. Colour dark hair-brown.

Rather brittle. Soft. Heavy.

It decrepitates briskly before the blowpipe, emits an arsenical odour, and is finally converted into a glass, which effervesces with borax.

It occurs at Schneeberg in Saxony.

ATACAMITE.

MALACHITE.

Prismatic Atacamite. JAM. Syst. Vol. II. p. 343. Man. p. 104. Muriate of Copper. PHILL. p. 313.

Prismatic. Combinations somewhat resembling Fig. 21.; often only the faces *o* and *d*, producing a combination like Fig. 1. Inclination of *o* on *o*

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(adjacent) = 107° 10′; of d on d (adj.) = 112° 45′; of M on M (over o) = 80°, z on z (over M) = 127° 7′. PHILLIPS. Reniform, massive: composition columnar.

Cleavage, perfect parallel to P, less distinct parallel to M.

Colours olive-, leek-, grass-, emerald-, and blackish-green. Streak apple-green. Nearly transparent ... translucent on the edges.

Rather brittle. Hardness = 3·0 ... 3·5. Sp. Gr. = 4·43, LEONHARD.

It communicates bright blue and green colours to the flame of a candle, or if exposed to the blast of the blow-pipe, it developes vapours of muriatic acid, and melts at last into a globule of copper. It is soluble without effervescence in nitric acid. It consists, according to PROUST and KLAPROTH, of

Oxide of Copper	76·595	73·00.
Muriatic Acid	10·638	10·10.
Water	12·767	16·90.

It is chiefly brought from Chili and Peru, but is also found in Europe, as in the repositories of Iron-ore at Schwarzenberg in Saxony, and upon lava in the neighbourhood of Mount Vesuvius. It is often produced when metallic copper or copper-ores have been exposed to the action of the atmosphere, or of sea-water.

BABINGTONITE.

SPAR.

Babingtonite. LÉVY. Ann. of Phil. XL. p. 275.

Tetarto-prismatic. Combination observed, represented Fig. 187. Angles, according to LÉVY:

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p on $m = 92° 34'$; p on $t = 88°$, t on $h = 155° 25'$, m on $t = 112° 30'$, m on $h = 137° 5'$, p on $d = 150° 25'$, g on $m = 132° 15'$, h on $g = 89° 20'$.

Cleavage distinct, parallel to p and t. Fracture imperfect conchoidal.

Lustre vitreous. Colour black, often greenish, thin splinters are faintly translucent, and of a green colour perpendicular to p, of a brown colour parallel to it. In larger crystals it appears opake. Hardness = 5·5 ... 6·0.

It resembles certain dark coloured varieties of paratomous Augite-spar. According to Mr CHILDREN, it is composed of silica, iron, manganese, and lime, with a trace of titanium. It occurs at Arendal in Norway in small crystals disposed on the surface of crystals of Albite.

BARYTO-CALCITE.

HAL-BARYTE.

Baryto-Calcite. BROOKE. Ann. of Phil. XLIV. p. 114. Edin. Journ. of Science. Vol. I. p. 378.

Hemi-prismatic. Combinations similar to Fig. 44. and Fig. 188. Inclination of M on $M = 106° 54'$, h on P (over a) $= 106° 8'$, P on $M = 102° 54'$, according to BROOKE; b on $b = 95° 15'$, h on the edge between b and $b = 119°$, P on the same edge $= 135°$, c on $c = 145° 54'$, d on d over $h = 68°$. It is also found massive, in granular compositions.

Cleavage perfect, parallel to M, less easily obtained

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though perfect parallel to *P*. Fracture uneven, imperfect conchoidal. Surface, *h* striated parallel to the edges of combination with *M*, the vertical prisms parallel to the axis.

Lustre vitreous, inclining to resinous. Colour white, greyish, yellowish, or greenish. Streak white. Transparent ... translucent.

Hardness = 4·0. Sp. Gr. = 3·66, CHILDREN.

It does not melt alone before the blowpipe, but gives a clear globule with borax. It consists, according to Mr CHILDREN, of

Carbonate of Barytes 65·9.
Carbonate of Lime 33·6.

It sometimes gives traces of iron and manganese.

It occurs in pretty considerable quantities at Alston Moor in Cumberland, both massive and crystallised.

The discovery of Baryto-Calcite is in particular favourable to shew the advantages of a systematic nomenclature. Upon examining its characters and resemblance to other species, it is immediately arranged with the genus Hal-baryte, and must therefore assume the denomination of the *hemi-prismatic Hal-baryte.*

BERGMANNITE.

SPAR.

Bergmannite. JAM. Man. p. 317. Var. of pyramidal Felspar or Scapolite. Syst. Vol. II. p. 43. Bergmannite. PHILL. p. 200.

Massive: composition thin columnar, or promiscuous.

Lustre pearly. Colour several tints of grey, passing into white and brick-red. Opake.

Not very brittle. Soft, passing into semi-hard,

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BREITHAUPT. Scratches glass, and even quartz,
HAÜY. Sp. Gr. = 2·300, SCHUMACHER.

Before the blowpipe it becomes white, and then melts without effervescence into a colourless glass. It occurs in the neighbourhood of Stavern in Norway, along with prismatic Feld-spar.

BISMUTHIC SILVER.

GLANCE ?

Bismuthic Silver. JAM. Syst. Vol. III. p. 554. Man. p. 318. Bismuthic Silver. PHILL. p. 294.

Acicular and capillary crystals. Massive: composition impalpable. Fracture uneven.
Lustre metallic. Colour light lead-grey, subject to be tarnished. Opake.
Sectile. Soft.

It melts readily before the blowpipe, covers the charcoal with an areola of the oxides of lead and bismuth, and finally yields a silver button. It is dissolved in dilute nitric acid, and, according to KLAPROTH, consists of

Lead	33·00.
Bismuth	27·00.
Silver	15·00.
Iron	4·30.
Copper	0·90.
Sulphur	16·30.

It has been found at Schapbach in Baden, along with several minerals of the orders Pyrites and Glance, and also with rhombohedral Quartz. It is used as an ore of silver.

BLACK COBALT OCHRE.

Black Cobalt-Ochre. JAM. Syst. Vol. II. p. 198. Man. p. 111. Earthy Cobalt. PHILL. p. 281.

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Botryoidal, stalactitic, massive: composition impalpable. Fracture conchoidal ... very fine earthy.
Colour blueish and brownish-black, blackish-brown. Streak shining, even in friable varieties, with a somewhat resinous lustre. Opake.
Sectile. Soils but little. Soft, sometimes passing into very soft. Sp. Gr. = 2·200, of the botryoidal compound variety from Saalfeld, BREITHAUPT.

Before the blowpipe it gives out an arsenical smell, and colours borax smalt blue. It consists of the oxides of cobalt and manganese.

It occurs at Saalfeld, Kamsdorf, and Glücksbrunn in Thuringia; at Riechelsdorf in Hessia, in the principality of Fürstenberg, in different mineral repositories, which also contain several species of Cobalt-pyrites. It is used in the fabrication of smalt.

It seems that the yellow and the brown cobalt ochre are in a close connexion with the black variety; yet they all require some farther examination.

BLOEDITE.

SALT.

Bloedit. JOHN. Chem. Unters. V. S. 240. LEONH. p. 636.

Massive: composition thin columnar. Fracture uneven, splintery.
Lustre faint, vitreous. Colour between flesh red and brick-red. Translucent, becoming opake and white by decomposition.
Soft.

It occurs at Ischel in Upper Austria, along with prismatic Gypsum-haloide and the Polyhalite. It consists, according to JOHN, of

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Sulphate of Magnesia	36·66.
Sulphate of Soda	33·34.
Protosulphate of Manganese	0·33.
Muriate of Soda	22·00.
Water	0·34.

with a mechanical admixture of persulphate of iron with excess of base.

BREISLAKITE.

This name has been given to a substance from Vesuvius in very delicate capillary crystals, of a reddish-brown or chestnut-brown colour, bent and grouped like wool, on the surface of cavities in a kind of lava, resembling the *Grau-stein* of WERNER. Its other properties have not been ascertained. It contains a considerable quantity of copper, giving with salt of phosphorus a green globuble in the oxidating flame, which becomes red in the reducing flame of the blowpipe.

BREWSTERITE.

KOUPHONE-SPAR.

Brewsterite. BROOKE. Edin. Phil. Journ. Vol. VI. p. 112.
Brewsterite. PHILL. p. 200.

Hemi-prismatic. Combination represented Fig. 189. Inclination of the edge between d and d on that between h and h, $= 93° 40'$; d on $d = 172°$. Prisms: $h = 176°$; $g = 136°$; $e = 131°$; $c = 121°$. BROOKE.

Cleavage, perfect parallel to P, traces parallel to a plane, which replaces the edge between h and h. Fracture uneven.

Surface of the prisms streaked parallel to their common intersections.

Lustre vitreous, pearly upon P. Colour white,

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inclining to yellow and grey. Transparent ... translucent.

Hardness = 5·0 ... 5·5. Sp. Gr. = 2·12 ... 2·20, Dr BREWSTER.

It is found in crystals and crystalline coats, associated with rhombohedral Lime-haloide, at Strontian in Argyllshire. It resembles particularly the prismatoidal and hemiprismatic Kouphone-spars, with which it has been formerly confounded. Before the blowpipe it loses first its water and becomes opake, then it froths and swells up, but is difficultly fusible. It gives a skeleton of silica with salt of phosphorus.

BROCHANTITE.

MALACHITE.

Brochantite. LÉVY. Ann. of Phil. Oct. 1824. p. 241.

Prismatic. Combination observed similar to Fig. 21. without *z*, and compressed between *P* and *P*. Inclination of *o* on *o*, adjacent = 150° 30′; of *M* on *M*, over the edge between *o* and *o* = 114° 20′, of *d* on *d*, adjacent = 63° 0′. LÉVY.

Cleavage, traces parallel to *M*. Surface, *M* blackish and dull, the remaining faces smooth and shining.

Colour emerald-green. Transparent.

Hardness = 3·5 ... 4·0, nearly.

According to the experiments before the blowpipe, made by Mr CHILDREN, it consists of sulphuric acid and oxide of copper. On account of its insolubility in water, it is either a salt with excess of base, or, as Mr CHILDREN supposes, it contains some other substance, as silica or alumina, beside the two above mentioned. It is found in small

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but well defined crystals on a reniform variety of the hemiprismatic Habroneme-malachite, which itself covers octahedral Copper-ore, in the Bank mine at Ekatherineburgh, Siberia.

BROOKITE.

ORE.

Brookite. LÉVY. Ann. of Phil. Febr. 1825.

Prismatic. P = 135° 46′, 101° 37′, 94° 44′. Vol. I. Fig. 9. LÉVY.

a : b : c = 1 : $\sqrt{}$ 3·237 : $\sqrt{}$ 1·149.

Simple forms. P — ∞ (*p*); P (e^3); (P̆r — 1)^3 ($b^{\frac{1}{2}}$) = 126° 31′, 135° 41′, 72° 0′; (P̆r + ∞)^3 (*m*) = 100° 0′; ($\frac{4}{3}$ P̆ — 2)^3 (*i*) = 124° 11′, 149° 37′, 65° 0′; $\frac{4}{3}$ P̄r ($e^{\frac{3}{8}}$) = 77° 36′; P̄r + 1 ($e^{\frac{1}{4}}$) = 56° 24′; P̄r + ∞ (*g*′); P̆r — 1 (a^2) = 148° 56′; P̆r (*a*′) = 124° 52′; P̆r + ∞ (*h*′).

Char. of Comb. Prismatic.

Combination. 1. P̆r — 1. P̆r. ($\frac{4}{3}$ P̆ — 2)^3. (P̆r — 1)^3. $\frac{4}{3}$ P̄r. P. (P̆r + ∞)^3. P̆r + ∞. P̄r + ∞. Snowdon. Fig. 190.

Lustre metallic adamantine. Colour hair-brown, passing into a deep orange-yellow, and some reddish tints. Streak yellowish-white. Translucent ... opake, the brighter colours are observed by transmitted light.

Brittle. Hardness = 5·5 ... 6·0.

It contains titanium, but has not yet been analysed. The first varieties were noticed by Mr SORET among the minerals accompanying pyramidal Titanium-ore from Dau-

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phiny; but much finer crystals, some of them half an inch in diameter, have lately been found at Snowdon in Wales. In both places they are accompanied by rhombohedral Quartz; in Dauphiny, besides pyramidal Titanium-ore, also by Crichtonite and Albite.

BUCKLANDITE.

Bucklandite. Lévy. Ann. of Phil. Febr. 1824. p. 134.

Hemi-prismatic. Combination observed similar to Fig. 16. only that the faces P', contiguous to o, are larger than those marked P.

Inclination of the faces, according to Lévy,

o on $d = 103° 56'$.	o on $P = 121° 30'$.
d on $d = 70° 40'$.	o on $o' = 99° 41'$.
d on $p = 125° 20'$.	o on $P' = 95° 40'$.
o on $p = 114° 55'$.	d on $P' = 160° 24'$.

Cleavage not observable. Colour dark-brown, nearly black. Opake. It appears to be harder than paratomous Augite-spar.

It was discovered in small crystals on a specimen from Neskiel mine, near Arendal in Norway, where it occurs with black hemi-prismatic Augite-spar, with pyramidal Feld-spar, and with rhombohedral Lime-haloide. It resembles paratomous Augite-spar.

CALAITE.

SPAR.

Calaïte or Mineral Turquois. Jam. Syst. Vol. I. p. 403. Man. p. 318. Calaite. Phill. p. 79. Calaite. Fischer. Essai sur la Turquoise. Moscow. 1816.

Massive: composition impalpable. Fracture conchoidal.

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Colour blue ... green, rather bright. Streak uncoloured. Feebly translucent on the edges ... opake.

Hardness = 6·0. Sp. Gr. = 2·830 ... 3·000, FISCHER.

It is not dissolved by muriatic acid. Before the blowpipe it becomes brown in the reducing flame, and gives a green colour to it. It is infusible by itself, but very easily with borax or salt of phosphorus. According to BERZELIUS, it consists of phosphate of alumina and lime, silica, oxide of iron and copper, and a little water.

It is found in Persia, either in pebbles, or in small veins traversing a kind of trap in its original repository. Cut and polished, it is used for different ornamental purposes.

CHIASTOLITE.

SPAR.

Chiastolite. JAM. Syst. Vol. II. p. 49. Man. p. 318. Chiastolite. PHILL. p. 201.

Prismatic. $P + \infty = 91° 50'$. $\breve{P}r = 120°$. HAÜY.

Cleavage, $P - \infty$. $P + \infty$. $\breve{P}r$. $\breve{P}r + \infty$. $\breve{P}r + \infty$, all of them imperfect. Fracture imperfect conchoidal, splintery. The crystals present a black cross in their transverse section.

Lustre vitreous, indistinct. Colour white, grey. Streak white. Translucent.

Hardness = 5·0 ... 5·5, if the mineral be not disintegrated. Sp. Gr. = 2·944, HAÜY.

Before the blowpipe the whitish part of the crystals is infusible, but assumes a purer white tint. It melts but difficultly with either borax or salt of phosphorus. According to BERZELIUS, it is a compound of silica and alumina.

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It occurs imbedded in clay-slate in a great number of places, at St Jago di Compostella in Spain; near Barèges in the Pyrenees; near Gefrees in the Bayreuth; besides in the Hartz, in Cumberland, in North America. It has also been found upon the Simplon in dolomite.

CHILDRENITE.

Childrenite. BROOKE. Brandes' Quarterly Journal, Vol. XVI. p. 274.

Prismatic. P = 130° 20′, 102° 30′, 97° 50′. BROOKE.

a : b : c = 1 : $\sqrt{2{\cdot}448}$: $\sqrt{1{\cdot}103}$.

Simple forms. P — ∞ (*f*); $\frac{4}{5}$ P (*b*) = 135° 56′, 111° 42′, 85° 3′. P (*e*); $\frac{5}{4}$ P̆r + 2 (*a*) = 55° 6′; P̆r + ∞ (*P*).

Cleavage, imperfect parallel to P̆r + ∞. Fracture uneven.

Lustre vitreous, inclining to resinous. Colour yellowish-white, wine-yellow, ochre-yellow, and pale yellowish-brown. Streak white. Translucent.

Hardness = 4·5 ... 5·0.

Dr WOLLASTON found it to be a compound of phosphoric acid, alumina, and iron. It has been hitherto found only in the neighbourhood of Tavistock, disposed in single crystals and crystalline coats on brachytypous Parachrose-baryte, hexahedral Iron-pyrites, and rhombohedral Quartz, occasionally accompanied by rhombohedral Fluor-haloide.

CHLOROPAL.

Chloropal, BERNHARDI and BRANDES. Schweigger's Journal. Chloropal. PHILL. p. 378.

Massive: composition impalpable, earthy. Fracture conchoidal, passing into earthy.

Colour pistachio-green. Opake, or scarcely translucent on the edges.

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Fragile. Hardness between 3·0 and 4·0. Sp. Gr. = 2·000, of a conchoidal variety; from 1·727 ... 1·870, the earthy varieties.

It consists, according to BRANDES, of

	Conchoidal var.	*Earthy var.*
Silica	46·00	45·00.
Oxide of Iron	35·30	32·00.
Manganese	2·00	0·00.
Alumina	1·00	0·75.
Water	13·00	20·00.
Manganese	a trace	2·00.
Potash	a trace	a trace.

It is remarkable for a very singular magnetic property. When taken from its original repositories, it breaks pretty readily in a kind of parallelopipeds, the upper end and two adjoining lateral edges having the opposite magnetic poles from the other two edges and the lower end. It is not phosphorescent.

It has been found accompanying uncleavable Quartz near Unghwar, in the county of the same name in Hungary, and is often called *Green Iron-Earth.*

CHLOROPHAEITE.

Chlorophaeite. MACCULLOCH. Western Isles. Vol. I. p. 504. PHILL. p. 202.

Massive: in small grains, imbedded in basalt or amygdaloid, and sometimes hollow. Fracture conchoidal ... nearly earthy.

Colour pistachio-green and transparent, or opake; but soon turning into brown and black on being exposed to the air, without losing its lustre, which takes place also to the depth of an inch or two into the rock.

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Brittle. Hardness, scratched by a quill. Sp. Gr. = 2·020.

Before the blowpipe it remains nearly unchanged, altering neither colour nor transparency. Besides silica, it contains iron and a little alumina. It occurs in Scuirmore cliff in the island of Rum, also in Fifeshire and in Iceland.

CHONDRODITE.

GEM.

Condrodite. HAÜY. Traité, 2de Ed. T. II. p. 476. Condrodite. Brucite. Maclureite. PHILL. p. 97.

Hemi-prismatic. $\frac{P}{2}$. $P + \infty = 147° 48'$. $\breve{P}r + \infty$.

HAÜY. Grains.

Cleavage, $\frac{\breve{P}r}{2} = 67° 48'$, very indistinct; also $\breve{P}r + \infty$. $\bar{P}r + \infty$.

Lustre vitreous. Colour yellow ... brown. Transparent ..., translucent.

Hardness = 6·5. Sp. Gr. = 3·199, of the variety from Ersby.

It is very difficultly fusible before the blowpipe. It loses its colour almost entirely, becomes opake, and shews traces of fusion in its thinnest edges. The brown varieties act upon the magnetic needle, particularly if the double magnetism is employed. According to D'OHSSON, it consists of

Silica	38·00.
Magnesia	54·00.
Oxide of Iron	5·10.
Alumina	1·50.
Potash	0·86.

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It occurs at Ersby in the parish of Pargas in Finland, along with Pargasite (hemi-prismatic Augite-spar) imbedded in rhombohedral Lime-haloide; also near Newton in Sussex county, New Jersey, along with Graphite and curved lamellar calcareous spar. Count D'OHSSON first described the Chondrodite from Pargas. Dr BRUCE discovered the American variety, which was named *Brucite* after him, by GIBBS. SEYBERT gave it the name of *Maclureite*.

COBALT-KIES.

PYRITES?

Cobalt-Kies. JAM. Syst. Vol. III. p. 289. Man. p. 270. Sulphuret of Cobalt. PHILL. p. 280.

Massive: composition granular ... impalpable. Individuals indistinctly cleavable. Fracture conchoidal, uneven.

Lustre metallic. Colour pale steel-grey, tarnished copper-red.

Semi-hard.

It emits a sulphureous odour before the blowpipe, and after having been roasted, it communicates a blue colour to glass of borax. It consists, according to HISINGER, of

Cobalt	43·20.
Copper	14·40.
Iron	3·53.
Sulphur	38·50.

It is found at Riddarhyttan in Sweden, in beds in gneiss, along with pyramidal Copper-pyrites, and hemi-prismatic Augite-spar.

COBALTIC GALENA OR COBALTIC LEAD-GLANCE.

GLANCE.

Cobaltic Galena or Cobaltic Lead-Glance. JAM. Syst. Vol. III. p. 368.

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Very small, moss-like, grouped crystals; massive: composition granular. Individuals cleavable. Colour lead-grey, inclining to blue. Lustre metallic, splendent (in the interior), shining. Opake. Soft, sectile. Soils a little. Sp. Gr. = 8·444, BAUERSACHS.

This mineral has been formerly confounded with hexahedral Lead-glance. It is very probable that when better known, it will be found to belong to the same genus.

Before the blowpipe it shews nearly the same phenomena as hexahedral Lead-glance; the only variety hitherto known communicates a smalt blue colour to glass of borax. It consists, according to DU MENIL, of

Lead	62·89.
Arsenic	22·47.
Sulphur	0·47.
Iron	2·11.
Cobalt	0·94.
Arsenical Pyrites	1·44.

The loss of 9·76 is attributed to intermixed rhombohedral Lime-haloide. The contents of lead and of arsenic are very nearly in the proportion of 73·34 : 26·66, corresponding to BERZELIUS' formula Pb As.

It has hitherto been found only in the level of St George near Clausthal in the Hartz, in a vein of clay-slate and brown-spar, traversing greywacke. It was first described by Messrs BAUERSACHS and DU MENIL.

COMPTONITE.

KOUPHONE-SPAR.

Comptonite. BREWSTER. Edin. Phil. Journ. Vol. IV. p. 131. BROOKE. Ibid. Vol. VI. p. 112. PHILL. p. 201.

Prismatic. Combination observed nearly similar to Fig. 25., without *o*. Inclination of *i* on *i* =

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177° 35′, of s on s (over M) = 91°, BROOKE; = 93° 45′ nearly, BREWSTER.

Cleavage, parallel to T and M, the first a little more distinct; also parallel to s. Fracture small conchoidal, uneven. Surface s striated parallel to the edges of combination with M and T; the remaining faces smooth.

Lustre vitreous. Colour white. Streak white. Transparent ...semi-transparent.

Hardness = 5·0 ... 5·5.

Before the blowpipe it gives nearly the same results as other species of the genus Kouphone-spar. It first gives off water, intumesces a little, and becomes opake, then it melts imperfectly into a vesicular glass. The globule obtained with borax is transparent, but vesicular; that with salt of phosphorus contains a skeleton of silica, and becomes opake on cooling. With a little soda it melts imperfectly, but with a larger quantity it becomes infusible. The glass with solution of cobalt is dirty blueish-grey. According to Dr BREWSTER, it forms a gelatine if exposed in the state of powder to the action of nitric acid.

It occurs in the cavities of an amygdaloidal rock, along with paratomous Kouphone-spar, and has been hitherto found only at Mount Vesuvius. The name of Comptonite, given to this species by Dr BREWSTER, was proposed by Mr ALLAN.

CRONSTEDTITE.

Cronstedtit. STEINMANN. Schweigger's Journal. Neue Reihe. T. II. S. 69. Cronstedtite. PHILL. p. 227.

Rhombohedral. R — ∞. R + ∞. Reniform, massive: composition columnar.

Cleavage, R — ∞ perfect; R + ∞ imperfect.

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Lustre vitreous. Colour brownish-black. Streak dark leek-green. Opake.

Thin laminæ are elastic. Hardness = 2·5 (nearly). Sp. Gr. = 3·348, STEINMANN.

Before the blowpipe it froths a little without melting: with borax it yields a black opake and hard bead. Reduced to powder, it gelatinises in concentrated muriatic acid. It consists, according to STEINMANN, of

Silica	22·452.
Oxide of Iron	53·853.
Oxide of Manganese	2·385.
Magnesia	5·078.
Water	10·700.

It occurs at Przibram in Bohemia, in veins containing silver-ores, along with prismatic Iron-ore, brachytypous Parachrose-baryte, prismatic Iron-pyrites, and rhombohedral Lime-haloide. It has also been found at Wheal Maudlin in Cornwall.

CUPREOUS BISMUTH.

GLANCE?

Cupreous Bismuth or Cupriferous Sulphuretted Bismuth. JAM. Syst. Vol. III. p. 386. Cupriferous Sulphuret of Bismuth. PHILL. p. 274.

Massive: composition columnar, impalpable. Fracture uneven.

Lustre metallic. Colour pale lead-grey, passing into steel-grey and tin-white; subject to tarnish. Streak black. Opake.

Sectile. Soft.

It is partly soluble in nitric acid, leaving the sulphur undissolved. According to KLAPROTH, it consists of

Bismuth	47·24.
Copper	34·66.
Sulphur	12·58.

It occurs in the principality of Fürstenberg, in cobalt-veins,

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along with octahedral Bismuth, pyramidal Copper-pyrites, &c.

CUPREOUS MANGANESE.

Cupreous Manganese. JAM. Syst. Vol. III. p. 558.

Small reniform and botryoidal groupes, massive. Composition impalpable. Fracture imperfect conchoidal.

Lustre resinous. Colour blueish-black. Streak unchanged. Opake.

Not particularly brittle. Intermediate between semi-hard and soft. Sp. Gr. = 3·197 ... 3·216, BREITHAUPT.

Before the blowpipe it becomes brown, but is infusible. To borax and salt of phosphorus it communicates the colours of copper and manganese. It consists, according to LAMPADIUS, of

Black Oxide of Manganese	82·00.
Brown Oxide of Copper	13·50.
Silica	2·00.

BERZELIUS found it to contain a considerable quantity of water.

It occurs in the tin mines at Schlaggenwald in Bohemia, and was first distinguished by Messrs BREITHAUPT and LAMPADIUS.

DIASPORE.

SPAR.

Diaspore. JAM. Man. p. 322. Diaspore. PHILL. p. 78. Diaspore. HAÜY. Traité, 1ère Ed. T. IV. p. 358.

Prismatic.* Cleavage P + ∞ = 130° (nearly). More distinctly P̆r + ∞.

* Mr PHILLIPS mentions a doubly oblique prism, a tetartoprismatic form, Sim. Fig. 82. Incidence of *M* on *T* = 64° 54′, of *P* on *T* = 101° 20′, of *P* on *M* = 108° 30′. H.

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Lustre vitreous; that of $\breve{P}r + \infty$ is pearly. Colour greenish-grey. Translucent on the edges. Scratches glass. HAÜY. Sp. Gr. = 3·4324. HAÜY.

Before the blowpipe it decrepitates most violently, and splits into many small scaly particles, possessing a feeble alcaline reaction. According to VAUQUELIN and CHILDREN, it consists of

Alumina	80·00	76·06.
Protoxide of Iron	3·00	7·78.
Water	17·30	14·70.

BERZELIUS is of opinion that, besides these, it also contains some alcaline substance.

Its locality is unknown.

ELAOLITE.

SPAR.

Elaolite. JAM. Syst. Vol. II. p. 41. Man. p. 322. Fettstein. PHILL. p. 136.

Prismatic. Cleavage, $P - \infty$. $\breve{P}r + \infty$. Less distinct $P + \infty = 112°$. PHILL. Massive. Fracture conchoidal.

Lustre resinous. Colour duck-blue, passing into blue and green, or brick-red passing into grey and brown. Translucent. If cut, several varieties become opalescent.

Hardness = 5·5 ... 6·0. Sp. Gr. = 2·546 ... 2·618, HOFFMANN.

Before the blowpipe it melts into a white enamel. Reduced to powder, it forms a copious gelatine with acids. According to KLAPROTH, it consists of

Silica	46·50.
Alumina	30·25.

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Lime	0·75.
Potash	18·00.
Oxide of Iron	1·00.
Water	2·00.

It occurs near Laurvig, Stavern, and Frederiksvärn in Norway, imbedded in Syenite along with prismatic Titanium-ore and pyramidal Zircon.

EUCAIRITE.

GLANCE.

Cuivre sélénié argental. HAÜY. Traité, 2de Ed. T. III. p. 470. Seleniuret of Silver and Copper. PHILL. p. 294. Eucairite. BERZELIUS.

Massive: composition granular. Cleavable.
Lustre metallic. Colour lead-grey. Streak shining. Opake.
Soft.

Before the blowpipe it melts easily, and emits the odour of selenium. It is soluble in boiling nitric acid. Component parts, according to BERZELIUS,

Silver	38·93.
Copper	23·05.
Selenium	26·00.
Foreign substances	8·90.

It has been found only at Skrikerum mine in the parish of Tryserum in Smaland in Sweden, in a talcose or serpentine-like rock, accompanied by rhombohedral Lime-haloide.

EUCHROITE.

EMERALD-MALACHITE.

Euchroite. HAIDINGER. Edinb. Journ. of Science. Vol. II. p. 133. Dr TURNER. Ibid. p. 301.

Prismatic. P = 119° 7′, 81° 47′, 120° 54′. Vol. I. Fig. 7. AP.

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$a : b : c = 1 : \sqrt{0{\cdot}928} : \sqrt{0{\cdot}344}$.

Simple forms. $P - \infty$ (P); $P + \infty$ $(M) = 117°\ 20'$; $(\breve{P}r + \infty)^5$ $(s) = 95°\ 12'$; $(\breve{P}r + \infty)^3$ $(i) = 78°\ 47'$; $\breve{P}r$ $(n) = 87°\ 52'$; $\breve{P}r + \infty$ (k).

Combinations. 1. $P - \infty$. $\breve{P}r$. $P + \infty$. $(\breve{P}r + \infty)^5$.
2. $P - \infty$. $\breve{P}r$. $P + \infty$. $(\breve{P}r + \infty)^5$. $(\breve{P}r + \infty)^3$. $\breve{P}r + \infty$. Fig. 192.

Cleavage, indistinct, parallel to n and m, interrupted. Fracture small conchoidal, uneven. Surface the vertical prisms striated, parallel to their common edges of combination, $P - \infty$ often rounded.

Lustre vitreous. Colour bright emerald-green. Streak pale apple-green. Double refraction considerable. Transparent, translucent.

Rather brittle. Hardness = 3·5 ... 4·0. Sp. Gr. = 3·359.

According to Dr TURNER, it consists of

Peroxide of Copper	47·85.
Arsenic Acid	33·02.
Water	18·89.

In the matrass it loses its water, and becomes yellowish-green and friable. When heated to a certain point upon charcoal, it is reduced in an instant with a kind of deflagration, leaving a globule of malleable copper, with white metallic particles dispersed throughout it, which are entirely volatile at a continued blast.

It was discovered at Libethen in Hungary, in quartzose mica slate, and brought to London, under the name of *Euchroite*. It will enter the genus Emerald-malachite of MOHS, under the name of the *prismatic Emerald-malachite*.

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EUDIALYTE.

SPAR.

Eudialyte. JAM. Man. p. 322. Eudyalite: PHILL. p. 122.

Fundamental form. Rhombohedron. R = 73° 24′ * Vol. I. Fig. 7. WEISS.

a = $\sqrt{13{\cdot}5}$.

Simple forms. R — ∞ (*o*); R — 2 (*z*) = 126° 13′; R — 1 = 84° 16′; R (*P*); R + ∞ (*c*); P + ∞ (*u*).

Char. of Comb. Rhombohedral.

Comb. 1. R — ∞. R — 2. R. P + ∞. Fig. 125. 2. R — ∞. R — 2. R. R + ∞. P + ∞.

Cleavage, R — ∞ distinct; R — 2 less distinct; R and P + ∞ traces, not always observable. Fracture conchoidal or uneven.

Surface smooth, but often rather uneven; of nearly the same description in all the forms.

Lustre vitreous. Colour brownish-red. Streak white. Translucent on the edges ... opake.

Hardness = 5·0 ... 5·5. Sp. Gr. = 2·898.

Before the blowpipe it melts into a leek-green scoria. If reduced to powder, it gelatinises with acids. According to STROMEYER, it consists of

Silica	52·00.
Zirconia	10·89.
Lime	10·14.
Soda	13·92.
Oxide of Iron	6·85.
Oxide of Manganese	2·57.
Muriatic Acid	1·03.

* This angle has been found by Mr LÉVY = 73° 40′. Edinb. Phil. Journ. Vol. XII. p. 81. H.

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It is found in Greenland mixed with dodecahedral Kouphone-spar, hemi-prismatic Augite-spar, and a mountain-green variety of prismatic Feld-spar. It was first described as a particular species by Professor STROMEYER.

FAHLUNITE.

Triclasite. HAÜY. Traité, 2de Ed. T. III. p. 140. Fahlunite. Tricklasite. PHILL. p. 56. Fahlunite. HISINGER.

Hemi-prismatic. $P + \infty = 109° 28'$. HAÜY. Reniform, massive. Cleavage, $\breve{P}r = 78° 28'$. $P + \infty$. Fracture conchoidal ... uneven, splintery.

Lustre vitreous. Colour olive-green and oil-green, passing into yellow, brown, and black. Streak greyish-white. Feebly translucent on the edges ... opake.

Scratches glass, HAÜY. Sp. Gr. = 2·61 ... 2·66, HISINGER.

Before the blowpipe it becomes pale grey, and melts in its thinnest edges. It is but slowly dissolved in glass of borax, and communicates to it the colour produced by oxide of iron. In consists, according to HISINGER, of

Silica	46·79.
Alumina	26·73.
Magnesia	2·97.
Protoxide of Iron	5·01.
Oxide of Manganese	0·43.
Water	13·50.

It occurs at Fahlun in Sweden, in a talcose or chloritic slate, along with hexahedral Lead-glance, pyramidal Copper-pyrites, &c. It was described by HISINGER under the name of Fahlunite. It is doubtful, whether the forms and hardness given on the authority of HAÜY, refer to the same substance.

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FERGUSONITE.

ORE.

Fergusonite. HAIDINGER. Trans. Roy. Soc. Edinb. Vol. X. Part 2d, p. 271. Allanite (in part). PHILL. p. 264.

Pyramidal. Fundamental form. Isosceles four-sided pyramid. P = 100° 28′, 128° 27′. Vol. I. Fig. 8. AP.

$$a = \sqrt{4{\cdot}5}.$$

Simple forms. P — ∞ (*i*); P (*s*); $\frac{(P-1)^5}{2}$ (*z*)

angle at the base = 159° 2′; $\frac{[(P+\infty)^5]}{2}$.

Char. of Comb. Hemi-pyramidal, with parallel faces.

Combinations. 1. P — ∞. $\frac{[(P+\infty)^5]}{2}$.

2. P — ∞. P. $\frac{[(P+\infty)^5]}{2}$. Fig. 110.

3. P — ∞. P. $\frac{(P-1)^5}{2}$. $\frac{[(P+\infty)^5]}{2}$. Fig. 193.

Cleavage, traces parallel to P. Fracture perfect conchoidal. Surface rather uneven.

Lustre imperfect metallic, inclining to resinous. Colour dark brownish-black, in thin splinters pale. Streak very pale brown, like peritomous Titanium-ore. Opake, in thin splinters translucent.

Brittle. Hardness = 5·5 ... 6·0. Sp. Gr. = 5·838, ALLAN; = 5·800, TURNER. Not magnetic.

It loses its colour before the blowpipe, and becomes pale greenish-yellow, but is alone infusible. It is entirely

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dissolved in salt of phosphorus, but some particles remain a long time unaltered. The pale greenish globule becomes opake by flaming, or on cooling, when very much saturated. Before the whole portion has been dissolved, it assumes a pale rose colour in the reducing flame. It has been considered as an Yttro-tantalite, which is not contradicted by the experiments before the blowpipe. It is described under that denomination in the German original of the present work.

It is found imbedded in rhombohedral Quartz at Kikertaursak near Cape Farewell in Greenland. The specimens to which the preceding description refers are in the cabinet of Mr ALLAN, who proposed the name of Fergusonite.

FIBROLITE.

Fibrolite. JAM. Syst. Vol. III. p. 535. Man. p. 322. Fibrolite. PHILL. p. 80.

Prismatic. P + ∞ = 100° (nearly). Cleavage P + ∞, imperfect. Fracture conchoidal. Massive: composition columnar.

Colour white, grey, inclining to green.

Harder than quartz, BOURNON. Sp. Gr. = 3·214, BOURNON.

It is infusible before the blowpipe. If rubbed it emits a dark red phosphoric light. According to CHENEVIX, it consists of

Silica	38·00.
Alumina	58·25.
Oxide of Iron	0·75.

It occurs in the Carnatic, and likewise in China, along with rhombohedral Corundum. It was described by Count BOURNON.

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FIGURESTONE OR AGALMATOLITE.

Figurestone or Agalmatolite. JAM. Syst. Vol. II. p. 261. Man. p. 126. Agalmatolite. PHILL. p. 119.

Massive: composition impalpable. Fracture coarse splintery, imperfectly slaty.

Colour white, grey, green, yellow, red, and brown, none of them bright. Acquires some lustre in the streak. Translucent, in most cases only on the edges.

Nearly sectile. Soft. Sp. Gr. = 2·815, KLAPROTH.

Before the blowpipe it is infusible, but becomes white. It is partly soluble in sulphuric acid, leaving a siliceous residue. It consists, according to KLAPROTH, of

Silica	54·50.
Alumina	34·00.
Potash	6·25.
Oxide of Iron	0·75.
Water	4·00.

It is brought from China. Less characteristic varieties have been found also in Transylvania and in Saxony. It is cut into figures and different ornaments.

FLUATE OF CERIUM.

Fluate of Cerium. BERZELIUS. On the Blowpipe, transl. by J. G. CHILDREN, p. 209. PHILL. p. 266.

i. *Neutral Fluate.*

Six-sided prisms, plates and amorphous masses. Colour reddish.

It has been found by BERZELIUS to consist of 30·43 fluate of protoxide of cerium, and 68·00 fluate of peroxide of cerium, with a trace of yttria. Heated in the matrass or the glass tube, it corrodes the glass; alone it does not

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fuse, but its colour changes to brown; with borax and salt of phosphorus it gives a red or orange coloured globule, which becomes pale on cooling. It occurs at Finbo and Broddbo near Fahlun, imbedded in Albite, rhombohedral Quartz, &c.

ii. *Fluate with excess of base.*

Traces of crystalline structure. Colour yellow.

It resembles porcelain jasper. It contains twice as much of the oxides of cerium as the preceding substance. It also comports itself much like it before the blowpipe. If heated alone on charcoal, its colour turns black at an incipient redness, but it assumes, on cooling, successively dark brown, red, and orange tints. It is found at Finbo.

iii. *Fluate of Cerium.*

Not described.

It has not been analysed, but presents nearly the same characters before the blowpipe as the preceding substance, except that in the matrass it does not give off so much water, and that its colour turns brown.

iv. *Fluate of Yttria and Cerium.*

Earthy, found in masses seldom exceeding the size of a pea. Colour pale red, sometimes deep red, yellow, or white. Easily scratched by the nail.

According to BERZELIUS, it is a mechanical mixture of fluate of yttria with fluate of cerium and silica. It gives nearly the same reactions as the Neutral Fluate i.

FLUELLITE.

HALOIDE ?

Fluellite of Wollaston. LÉVY. Ann. of Phil. Oct. 1824. p. 241.

Prismatic. P = 109°, 82°, 144°. Vol. I. Fig. 9. Transverse section = 105° (nearly). WOLLASTON.

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Colour white. Transparent. Index of refraction = 1·47 (that of the Wavellite being = 1·52), WOLLASTON.

It occurs in minute crystals affecting the form of the fundamental pyramid, with its most acute solid angle replaced, along with the Wavellite from Cornwall, and was discovered by LÉVY, but named and examined by WOLLASTON, who found it to contain alumina and fluoric acid.

FORSTERITE.

GEM.

Forsterite. LÉVY. Ann. of Phil. XXXVII. p. 61.

Prismatic. Combination observed similar to Fig. 28, without *z* and *P*. Inclination of *M* on *M* = 128° 54′; of *y* on *y* (over *M*) = 107° 48′; *y* on *y* (adjacent) = 139° 14′.

Cleavage easy parallel to *o*.

Colourless, brilliant, translucent.

Hard enough to scratch quartz.

It contains, according to Mr CHILDREN, silica and magnesia. It was discovered by Mr LÉVY in small crystals, accompanying pleonaste and olive-green pyroxene on Mount Vesuvius. The angles of this substance agree pretty nearly with those of prismatic Corundum, given Vol. II. p. 304., in the same succession = 128° 35′, 107° 29′, and 139° 53′, only the face perpendicular to the axis, which in Forsterite has even an easy cleavage parallel to it, has not yet been observed in prismatic Corundum.

GEHLENITE.

SPAR.

Gehlenite. JAM. Syst. Vol. I. p. 138. and Vol. III. p. 536. Man. p. 323. Gehlenite. PHILL. p. 35.

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Pyramidal or prismatic. P — ∞. P + ∞ or P — ∞. P̆r + ∞. P̄r + ∞. Cleavage, P — ∞ distinct, the other faces imperfect.

Lustre resinous, inclining to vitreous. Colour different shades of grey, none of them bright. Opake. Sometimes faintly translucent on the edges.

Brittle. Hardness = 5·5...6·0. Sp. Gr. = 3·029.

It is difficultly fusible before the blowpipe, and only in thin splinters. Also in borax it is very slowly dissolved. It gelatinises in heated muriatic acid. It consists, according to FUCHS, of

Alumina	24·80.
Silica	29·64.
Lime	35·30.
Oxide of Iron	6·56.
Water	3·30.

It has been found on Mount Monzoni, in the valley of Fassa in the Tyrol, along with rhombohedral Lime-haloide. It was described by Professor FUCHS.

GIBBSITE.

Gibbsite. TORREY. New York Medical and Physical Journal. No. I. p. 68.

Irregular stalactites, tuberose masses.

Structure fibrous, the fibres radiating from the centre.

Lustre faint. Colour dirty greenish- or greyish-white. Slightly translucent.

Hardness a little above 3·0, but easily reduced to powder. Sp. Gr. = 2·400.

It yielded to TORREY, alumina 64·8, and water 34·7. It whitens before the blowpipe, but is infusible. Its locality

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is Richmond in Massachusetts, North America, where it is found along with prismatic Iron-ore.

GIESECKITE.

Gieseckite. JAM. Man. p. 323. Gieseckite. PHILL. p. 113.

Rhombohedral. R — ∞. R + ∞. Cleavage not perceptible. Fracture uneven, splintery.

Lustre resinous, faint. Colour olive-green, grey, brown. Streak uncoloured. Feebly translucent on the edges ... opake.

Hardness = 2·5 ... 3·0. Sp. Gr. = 2·832.

According to STROMEYER, it consists of

Silica	46·07.
Alumina	33·82.
Magnesia	1·20.
Black Oxide of Iron	3·35.
Oxide of Manganese	1·15.
Potash	6·20.
Water	4·88.

It occurs in Greenland, with prismatic Feld-spar. It was first described by Mr SOWERBY.

GMELINITE.

KOUPHONE-SPAR.

Sarcolite. VAUQUELIN. Ann. du Mus. IX. 249. XI. 42. Var. of Analcime. HAÜY. Traité, 2de Ed. T. III. p. 177. Hydrolite. DE DRÉE. Musée. p. 18. Gmelinite. BREWSTER. Edin. Journ. of Science. Vol. II. p. 262.

Rhombohedral. Combination P — ∞. P. P + ∞, similar to Fig. 196. Angles approaching to those of rhombohedral Kouphone-spar, which are for the isosceles pyramid = 145° 54′, 71° 48′. The inclination of y on y', Dr BREWSTER found to be = 83° 36′.

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Cleavage distinct, parallel to R. Fracture uneven. Surface streaked, the prism in a horizontal direction, the isosceles pyramid parallel to the edges of combination with R ; R — ∞ rough, but even.
Lustre vitreous. Colour white passing into flesh-red. Streak white. Translucent.
Hardness = 4·5. Sp. Gr. = 2·05, BREWSTER.

The Sarcolite of VAUQUELIN, which is quite different from the Sarcolite of THOMSON, is the same mineral to which DE DRÉE has given the name of Hydrolite, and has no connexion with the Analcime, as was supposed by HAÜY. The low degrees of hardness already remarked by VAUQUELIN, and the form discovered by LÉMAN in the varieties from the Vicentine, prove incontestibly that this mineral agrees more nearly with the rhombohedral Kouphone-spar. The variety represented in Fig. 196 is of a white colour, and marked with striæ, shewing indications of a regular composition according to the same law which so frequently occurs in other varieties of that mineral, and in Levyne. It was found by Mr ALLAN in the little deer park of Glenarm, county of Antrim, Ireland, and mentioned in his *Synonymes;* it was recognised by LÉMAN as a variety of the Hydrolite from the Vicentine. Two analyses of the varieties from Vicenza and Castel yielded to VAUQUELIN,

Silica	50·00	50·00.
Alumina	20·00	20·00.
Lime	4·50	4·25.
Soda	4·50	4·25.
Water	21·00	20·00.

Dr BREWSTER found that Gmelinite possesses the property of flying off in numerous scales when held in the flame of a candle, and that its refractive power is lower than that of rhombohedral Kouphone-spar, the index being only 1·474. Both in the Vicentine and in Ireland it occurs in the cavities of amygdaloidal rocks.

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GREEN IRON-EARTH.

Grüne Eisenerde. WERN. Hoffm. H. B. III. 2. S. 304.

Reniform, botryoidal, globular. Surface smooth and shining. Composition very thin columnar, impalpable, also curved lamellar. Massive: composition impalpable. Fracture even ... uneven. Sometimes in the state of powder.

Lustre resinous. The impalpable particles dull. Colours siskin-green, passing into black and yellow. Streak yellowish-grey.

Brittle. Semi-hard. Not particularly heavy.

It becomes brown and black before the blowpipe, but does not melt. It is said to colour glass of borax red. It is not dissolved in nitric acid. Both the friable and the massive varieties have been found at Schneeberg in Saxony, and in the Hollerter Zug in the county of Sayn.

HATCHETINE.

Hatchetine. J. J. CONYBEARE. Ann. of Phil. Vol. I. p. 136. PHILL. p. 374.

In the shape of flakes like spermaceti, or of granular masses, like bees' wax.

Lustre slightly glistening and pearly, and of considerable degrees of transparency, when in flakes, else dull and opake. Colour yellowish-white, wax-yellow, and greenish-yellow.

Hardness, like soft tallow. Very light. Without odour or elasticity.

It melts below the boiling point of water. Ether dissolves it readily; being evaporated, the solution leaves a viscid oily inodorous matter. Distilled over the spirit-lamp, it gives a bituminous smell, a greenish-yellow butyraceous substance is disengaged, and a coaly residue remains in the

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retort. At a lower temperature a light oil is distilled. It occurs in small contemporaneous veins with rhombohedral Quartz, rhombohedral Lime-haloide, and Iron-ores, at Merthyr Tydvil in South Wales. It has been described by Mr BRANDE under the denomination of *Mineral Adipocire.*

The description of Hatchetine agrees very nearly with the following one given of *Mountain Tallow*, in Vol. XI. of the Edinburgh Philosophical Journal.

Mountain Tallow has the colour and feel of tallow, and is tasteless; its specific gravity is = 0·6078 in its natural state, but it is increased by melting it to 0·983, the air bubbles being driven off. It melts at 118°, and boils at 290°; when melted it is transparent and colourless, but becomes opake and white on cooling. It is insoluble in water, but is dissolved by alcohol, oil of turpentine, olive-oil, and naphtha, when hot, but is precipitated when they cool. It does not form soap with alcaline substances, but is combustible. It has been found in a bog on the borders of Loch Fyne, and has been formerly noticed on the coast of Finland; in one of the Swedish lakes; near Strasburg; and by Professor JAMESON in Scotland.

HAÜYNE.

SPAR.

Haüyne. JAM. Syst. Vol. I. p. 394. Man. p. 323.
Haüyne. PHILL. p. 111.

Tessular. Crystallised in dodecahedrons. Grains. Cleavage dodecahedron, not very distinct. Fracture uneven.

Lustre vitreous. Colour blue, commonly bright, verging to green, white. Streak white. Transparent ... translucent.

Scratches glass easily. HAÜY. Sp. Gr. = 2·687, L. GMELIN; = 3·333, GISMONDI.

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Before the blowpipe it melts into a vesicular glass, and loses its colour. It effervesces if melted with glass of borax, and forms a transparent globule, which becomes yellow on cooling. According to L. GMELIN, it consists of

Silica	35·48.
Alumina	18·87.
Lime	12·00.
Sulphuric Acid	12·39.
Potash	15·45.
Oxide of Iron	1·16.
Water	1·20.

It occurs at Albano and Frascati near Rome, among the products of Vesuvius. Also in the neighbourhood of the Puy de Dome, on the lake of Laach, in the quarries of Niedermennich, and in several other places near Andernach, partly imbedded in pumice.

HISINGERITE.

Hisingrit. BERZELIUS. Afhandl. i Fysik, &c. III. S. 304. Hisingerite. PHILL. p. 204.

Massive. Cleavage distinct in only one direction. Fracture earthy.

Colour black. Streak greenish-grey.

Sectile. Soft. Sp. Gr. = 3·045.

If gently heated before the blowpipe, it becomes magnetic; in a stronger heat it melts into a dull opake black globule, and yields a yellowish-green glass with borax. It consists, according to BERZELIUS, of

Oxide of Iron	51·50.
Silica	27·50.
Alumina	5·50.
Oxide of Manganese	0·77.
Volatile substance	11·75.
Magnesia	a trace.

It has been found in the parish of Svärta in Süderman-land, intermixed with rhombohedral Lime-haloide.

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HOPEITE.

HALOIDE.

Hopeite. BREWSTER. Trans. Roy. Soc. Edinb. Vol. X. p. 107.

Prismatic. P = 139° 41′, 107° 2′, 86° 49′. Vol. I. Fig. 9. AP.

a : b : c = 1 : √ 4·443 : √ 1·493.

Simple forms. P — ∞ (*g*); P (*P*); (P̆r + ∞)^5 (*s*) = 81° 34′; P̄r (*M*) = 101° 24′; P̄r + ∞ (*l*); P̆r + ∞ (*p*).

Char. of Comb. Prismatic.

Combination. P — ∞. P̆r. P. (P̆r + ∞)^5. P̆r + ∞. P̄r + ∞. Fig. 29.

Cleavage, P̄r + ∞ perfect, less distinct P̆r + ∞. Surface, P̆r + ∞ deeply streaked in a longitudinal direction, the rest of the faces smooth.

Lustre vitreous, pearly upon P̄r + ∞. Colour greyish-white. Streak white. Transparent ... translucent. Refraction double; two axes, the principal one perpendicular to the axis of P and to the face *l*; angle of the resultant axes about 48°, in the plane of P — ∞ (*g*), contiguous to the obtuse lateral solid angle of P. Index of ordinary refraction nearly 1·601.

Sectile. Hardness = 2·5 ... 3·0. Sp. Gr. = 2·76, BREWSTER, of a perfect crystal.

Hopeite had been formerly considered as a variety of Stilbite. According to NORDENSKIÖLD, it gives off its water before the blowpipe, and then melts easily into a clear colourless globule, which tinges the flame green. It gives no skeleton of silica with salt of phosphorus, with which it

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melts in all proportions. If much of the mineral is added, the globule turns opake on cooling, but does not deposit any fumes of zinc on the charcoal. The globule obtained from fusing it with borax does not become opake on cooling. With soda it gives a scoria, which is yellow when hot; copious fumes of zinc, and nearest the scoria also some of cadmium are deposited. The melted mineral forms a fine blue glass with solution of cobalt. Hopeite seems therefore to be a compound of some of the stronger acids, as phosphoric or boracic acid, of zinc, an earthy base, a little cadmium, and a great deal of water.

It has been hitherto found only in the calamine mines of Altenberg near Aix-la-Chapelle, and is very rare.

HUMBOLDTINE.

Humboldtine. MARIANO DE RIVERO. Ann. de Chimie.

Crystals belonging to the pyramidal system, according to HAÜY; massive plates.

Colour bright yellow.

Soft, yielding to the nail. Sp. Gr. = 1·3.

Acquires resinous electricity by friction.

According to RIVERO, it consists of

Protoxide of Iron	53·56.
Oxalic Acid	46·14.

On ignited charcoal it is decomposed, giving out a vegetable odour, while the colour of the remaining oxide of iron is changed into different shades of yellow, then black, and at last red. It is insoluble in water and alcohol. It occurs imbedded in moor-coal, near Bilin in Bohemia, and is supposed by RIVERO to have been produced from the decomposition of succulent plants.

HUMITE.

Humite. BOURNON. Cat. p. 52. PHILL. p. 205.

Form prismatic, according to PHILLIPS; combina-

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tions somewhat resembling Fig. 28. and 38., with numerous pyramids and prisms between the six-sided terminal face and the six-sided prism, which has two angles of 129° 40′ and four of 115° 10′. There occurs frequently regular composition, as in prismatic Lime-haloide, parallel to the faces of a rhombic prism.

Cleavage, traces parallel to the six-sided face. Fracture imperfect conchoidal.

Lustre vitreous. Colour various shades of yellow, sometimes almost white, passing into reddish-brown. Transparent ...translucent.

Brittle. Hardness = 6·5 ... 7·0.

It occurs on Monte Somma, with mica and various other minerals. Alone before the blowpipe it becomes opake on the outside, but is infusible. It gives a clear glass with borax.

HYALOSIDERITE.

Hyalosiderit. WALCHNER. Schweiggers Neues Journal. Vol. IX. p. 65. Edin. Journ. of Science. Vol. I. p. 184.

Prismatic. Combination similar to Fig. 9. Inclination of *M* on *M′* adjacent, 77° 50′, of P on P′, adjacent, 99° 22′.

Cleavage indistinct parallel to *h*. Fracture small conchoidal. Surface tarnished brass-yellow, or gold-yellow.

Lustre vitreous, on the surface metallic. Colour reddish- or yellowish-brown. Streak of a cinna-

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mon colour. Translucent on the edges, hyacinth-red or wine-yellow.

Hardness = 5·5. Sp. Gr. = 2·875.

It consists, according to Dr WALCHNER, of

Silica	31·634.
Protoxide of Iron	29·711.
Magnesia	32·403.
Alumina	2·211.
Oxide of Manganese	0·480.
Potash	2·788.
Chrome	a trace.

Before the blowpipe it becomes first black and magnetic, and then melts into a black magnetic globule. It was found imbedded in a brown basaltic amygdaloid in the Kaiserstuhl near Sasbach in Brisgaw, accompanied by paratomous Augite-spar, &c. The mixture of iron-slags and of prismatic Chrysolite are very analogous to that of Hyalosiderite, and the latter is therefore considered by MITSCHERLICH as a peridot, in the chemical sense of the word, meaning a silicate of protoxide of iron, or of the isomorphous bases of protoxide of manganese, magnesia, &c. having the same prismatic form. Hardness and specific gravity are given lower than would be necessary for uniting Hyalosiderite with the natural-historical species of prismatic Chrysolite.

HYDRATE OF MAGNESIA.

MICA.

Native Hydrate of Magnesia. BREWSTER. Trans. Roy. Soc. Edin. Vol. IX. p. 239. Native Magnesia. JAM. Syst. Vol. II. p. 279. Man. p. 468. Hydrate of Magnesia. PHILL. p. 95.

Rhombohedral. Low six-sided prisms, rare.* Mas-

* A fine specimen of this variety is in the possession of Dr ANDERSON of Leith. H.

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sive: composition lamellar, broad columnar, the latter sometimes stellular.

Cleavage, R — ∞ perfect.

Lustre pearly upon the perfect faces of cleavage. Colour white, inclining to green. Streak white. Translucent, sometimes only on the edges. Some varieties lose their transparency on being exposed to the open air.

Sectile. Thin laminæ flexible. Hardness = 1·0 ... 1·5. Sp. Gr. = 2·350, the variety from Unst.

Before the blowpipe it loses in transparency and weight, and becomes friable. In acids it is dissolved without effervescence, and consists, according to Drs BRUCE and FYFE, of

Magnesia	70·00	69·75.
Water	30·00	30·25.

It occurs at Hoboken in New Jersey, in small veins in serpentine; also at Swinaness in Unst, one of the Shetland isles, under similar circumstances. In the latter place it is frequently associated with a white variety of rhombohedral Lime-haloide.

INDIANITE.

SPAR.

Indianite. BOURNON. Phil. Trans. Y. 1802. II. p. 233.
Indianite. PHILL. p. 44.

Grains. Cleavage in two directions, forming an angle of 95° 15′, BROOKE.

Colour greenish-white. Translucent.

Scratches glass. Sp. Gr. = 2·74, BOURNON.

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It is infusible before the blowpipe. If digested in acids, it becomes friable and gelatinous. It consists, according to CHENEVIX, of

Silica	42·50.
Alumina	37·50.
Lime	15·00.
Oxide of Iron	3·00.

and a trace of Oxide of Manganese.

It occurs in the Carnatic, imbedded in prismatic Feld-spar, and accompanied by rhombohedral Corundum, dodecahedral Garnet, hemi-prismatic and prismatoidal Augitè-spar. Indianite is not a well defined species. Mr BROOKE observes, that the angle of its cleavage planes is that of silicate of lime (prismatic Augite-spar). It is supposed by BEUDANT to be a variety of Labradorite.

IRIDIUM.

METAL.

Iridium. JAM. Syst. Vol. III. p. 54. Alloy of Iridium and Osmium. PHILL. p. 326.

Rhombohedral. Six-sided prisms, combined in parallel position with two isosceles six-sided pyramids, having bases of 110° 36′ and 130° 6′. BOURNON. Cleavage perpendicular to the axis. Grains. Lustre metallic. Colour pale steel-grey. Opake. Brittle. Harder than native Platina. Sp. Gr. = 19·5, WOLLASTON.

If melted with nitre it becomes black; but again acquires both its colour and lustre, if heated with charcoal. It is not dissolved by nitro-muriatic acid. It is an alloy of iridium and osmium, and is found in South America with native Platina. It was first described by Dr WOLLASTON.

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IRON-SINTER.

Iron-Sinter. JAM. Syst. Vol. III. p. 250.

Reniform, stalactitic ... massive. Composition impalpable. Fracture conchoidal.

Lustre vitreous. Colour yellowish-, reddish-, blackish-brown. Transparent ... translucent on the edges.

Not very brittle. Soft. Sp. Gr. = 2·40, KARSTEN.

Before the blowpipe it intumesces, and some varieties emit a strong arsenical odour, during which they are partly volatilised. It consists, according to KLAPROTH and STROMEYER, of

Oxide of Iron	67·00	33·46.
Arsenic Acid	0·00	26·06.
Sulphuric Acid	8·00	10·75.
Protoxide of Manganese	0·00	0·59.
Water	25·00	28·48.

It is found in several old mines, as at Freiberg and Schneeberg in Saxony, and in Upper Silesia.

JEFFERSONITE.

AUGITE-SPAR.

Jeffersonite (Polystomous Augite-Spar). KEATING. Journ. Acad. Nat. Sciences, Philadelphia. Vol. II. p. 194. Edinb. Phil. Journ. Vol. VII. p. 317. Jeffersonite. PHILL. p. 24.

Hemi-prismatic. Massive. Cleavage, P + ∞ = 106°; also P — ∞, inclined at angles of 94° 45′ and 85° 15′ to the axis, less perfect than the former; besides these, also other faces occur, which are parallel to the axis, and intersect each other at angles of 116° and 64°, and of 99° 45′ and 80° 15′, according to KEATING. Fracture uneven.

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Lustre resinous: upon the faces of cleavage semi-metallic. Colour dark olive-green, passing into brown. Streak light green. Slightly translucent on the edges.

Hardness = 4·5. Sp. Gr. = 3·51 ... 3·60, KEATING.

Before the blowpipe it melts easily into a black globule. In heated nitro-muriatic acid one-tenth of it is dissolved, and the residue assumes a lighter colour. It consists, according to KEATING, of

Silica	56·00.
Lime	15·10.
Protoxide of Manganese	13·50.
Peroxide of Iron	10·00.
Oxide of Zinc	1·00.
Alumina	2·00.

It occurs near Sparta, Sussex county, New Jersey, along with octahedral and dodecahedral Iron-ore, dodecahedral Garnet, Chondrodite, &c. It is very nearly allied to the paratomous Augite-spar.

KARPHOLITE.

Karpholite. JAM. Man. p. 324. Karpholite or Carpholite. PHILL. p. 22.

Massive: composition thin columnar, scopiform and stellular, rather incoherent, meeting again in angularly granular compositions.

Lustre silky, colour high straw-yellow, sometimes approaching to wax-yellow. Opake.

The hardness appears to be low. Sp. Gr. = 2·935, BREITHAUPT.

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It intumesces before the blow-pipe, becomes white, and melts imperfectly into a coherent mass. It consists, according to STEINMANN and STROMEYER, of

Silica	37·53	36·154.
Alumina	26·48	28·669.
Protoxide of Manganese	17·09	19·160.
Protoxide of Iron	5·64	2·290.
Lime	0·00	0·271.
Fluoric Acid	0·00	0·470.
Water	11·36	10·780.

It occurs in granite at Schlaggenwald in Bohemia, accompanied by octahedral Fluor-haloide and rhombohedral Quartz.

KILLINITE.

Killinite of Taylor. PHILL. p. 322.

Irregular imbedded crystals, massive.

Cleavage parallel to a rhombic prism of 135° (nearly), and its short diagonal, PHILL. Fracture uneven.

Lustre vitreous, faint. Colour greenish-grey, often tinged brown by oxide of iron. Streak yellowish-white. Faintly translucent.

Sectile. Hardness = 4·0. Sp. Gr. = 2·698.

Its analysis by Dr BARKER yielded

Silica	52·49.
Alumina	24·50.
Potash	5·00.
Oxide of Iron	2·49.
Oxide of Manganese	0·75.
Water	5·00.

with 0·50 of lime, magnesia, and iron. It becomes white before the blowpipe, intumesces, and melts into a white enamel. It occurs in granite veins traversing mica-slate, at Killiney near Dublin in Ireland, along with prismatic Triphane-spar and rhombohedral Quartz.

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KNEBELITE.

Knebelite of Lenz and Doebereiner. PHILL. p. 206.

Massive. Fracture imperfect conchoidal.

Lustre glistening. Colour grey, spotted dirty white, red, brown, and green. Opake.

Hard. Brittle. Difficultly frangible. Sp. Gr. = 3·714, DOEBEREINER.

It was found by DOEBEREINER to contain silica 32·5, protoxide of iron 32·0, and protoxide of manganese 35·0.

KUPFERINDIG.

Kupferinding. BREITHAUPT. Hoffm. H. B. IV. 2. S. 178.

Implanted spheroidal shapes, with a crystalline surface. Massive, plates: composition impalpable. Fracture flat conchoidal, uneven.

Lustre resinous, faint. Colour indigo-blue, inclining sometimes to blackish-blue. Higher resinous lustre in the streak. Opake.

Not particularly sectile. Intermediate between soft and very soft. Sp. Gr. = 3·80 ... 3·82, BREITH.

Before the blowpipe it burns before it becomes red-hot, with a blue flame, and melts into a globule, which is strongly agitated, and emits sparks. Finally it yields a button of copper. It occurs at Sangerhausen in Thuringia, the imitative crystalline varieties at Leogang in Salzburg.

LATROBITE.

SPAR.

Latrobite. BROOKE. Ann. of Phil. XXIX. p. 383. PHILL. p. 380. CHILDREN. Ann. of Phil. XLIII. p. 38. Diploite of Breithaupt. GMELIN. Edinb. Journ. of Science. Vol. II. p. 287.

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Tetarto-prismatic. Crystallised and massive.
Cleavage in three directions, intersecting each other at angles of 98° 30′, 91°, and 93° 30′.
Colour pale red. Hardness, between 5·0 and 6·0.
Sp. Gr. = 2·8, BROOKE; = 2·720, GMELIN.

According to CHILDREN, it fuses before the blowpipe in the platina forceps into a white enamel. With borax it yields a globule, pale amethyst red in the oxidating flame, and colourless in the reducing one. With salt of phosphorus, a globule with a silica skeleton is obtained, yellow in the oxidating flame, and becoming opake on cooling, transparent in the reducing flame. Professor GMELIN of Tübingen obtained from two analyses, one of them with carbonate of baryta, the other with carbonate of soda, the following results:

Silica	44·653	41·780.
Alumina	36·814	32·827.
Lime	8·291	9·787.
Oxide of Manganese	3·160	5·767,
Magnesia, with some manganese	0·628	with a little magnesia.
Potash	6·575	6·575.
Water	2·041	2·041.

It occurs in Amitok island, near the coast of Labrador, with mica and rhombohedral Lime-haloide.

LEELITE.

Leelite. CLARKE. Ann. of Phil. 1818. PHILL. p. 21.

Massive. Fracture splintery. Lustre and translucency like horn. Sp. Gr. = 2·71, CLARKE.

It consists, according to CLARKE, of silex 75, alumina 22, manganese 2·5, water 0·50. It occurs at Gryphytta in Westmania in Sweden.

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LEVYNE.

KOUPHONE-SPAR.

Levyne. Dr BREWSTER. Edinb. Journ. of Science. Vol. II. p. 332.

Rhombohedral. $R = 79° 29'$. Vol. I. Fig. 7. AP. $a = \sqrt{3·3}$.

Simple forms. $R - \infty$ (o); $R - 1$ (g) $= 106° 4'$; R (P); $\frac{3}{4} R + 1$ (n) $= 70° 7'$.

Char. of Comb. Rhombohedral.

Combination. $R - \infty$. $R - 1$. R. Fig. 194. represents two individuals compound parallel to $R - \infty$, the individuals continued beyond the face of composition, as in rhombohedral Kouphone-spar. Inclination of o on $g = 136° 1'$, of o on $P = 117° 24'$, of o on $n = 109° 13'$.

Cleavage, indistinct, parallel to R. Fracture imperfect conchoidal. Surface, $R - 1$ and R streaked parallel to their common edges of intersection. $R - \infty$ uneven, and generally curved, so that the opposite faces are often inclined on each other at an angle of $2° - 3°$.

Lustre vitreous. Colour white. Streak white. Semi-transparent.

Brittle. Hardness $= 4·0$.

Levyne was first observed by Mr HEULAND, and suspected to be a new mineral. Dr BREWSTER afterwards subjected it to an optical examination, and gave to it the name of Levyne, in honour of Mr LÉVY, who had first examined its crystallographic properties.

In the glass tube it gives off a considerable quantity of water, and becomes opake. Upon charcoal it intumesces a little. With salt of phosphorus it yields a transparent

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globule, which contains a skeleton of silica, and becomes opake on cooling. It occurs at Dalsnypen in Faroe, with hemi-prismatic Kouphone-spar, in the vesicular cavities of an amygdaloid.

LIGURITE.

VIVIANI. Mem. dell' Accad. delle Scienze, lettere ed arti di Genova. III. Ligurit. LEONHARD. S. 651. Ligurite. PHILL. p. 207.

Hemi-prismatic. $\frac{\breve{P}r}{2}$. $P + \infty = 140°$. $\breve{P}r + \infty$.

Inclination of $\frac{\breve{P}r}{2}$ on $\breve{P}r + \infty = 152°$ (nearly).

Fracture uneven.

Lustre of the fracture intermediate between vitreous and resinous. Colour apple-green. Streak greyish-white. Transparent ... translucent.

Hardness above 5·0. It is said to be harder than oriental chrysolite. Sp. Gr. = 3·49.

According to VIVIANI, who gave the preceding description of this mineral, it consists of

Silica	57·45.
Alumina	7·36.
Lime	25·30.
Magnesia	2·56.
Oxide of Iron	3·00.
Oxide of Manganese	0·50.

It has only been found on the banks of the Stura in the Appennines, in a talcous rock.

MAGNESITE.

HALOIDE.

Magnesite. JAM. Syst. Vol. II. p. 281. Man. p. 315. Carbonate of Magnesia. PHILL. p. 179.

Reniform, tuberose, massive. Composition impalp-

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able. Fracture flat conchoidal, sometimes fine earthy.

Dull. Colour yellowish-grey, cream-yellow, yellowish- and greyish-white. Streak white. Feebly translucent on the edges ...opake.

Not very brittle. Semi-hard in a moderate degree (between 3·0 and 4·0). Compound varieties are often very tough; it has been observed that some of them give sparks with steel, and yet do not scratch the octahedral Fluor-haloide. Sp. Gr. = 2·808, BREITHAUPT.

Adheres pretty strongly to the tongue.

It is infusible before the blowpipe. It is dissolved with a slow effervescence in the nitric and dilute sulphuric acids. According to LAMPADIUS and KLAPROTH, it consists of

	From Moravia.	*From Stiria.*
Magnesia	47·00	48·00.
Carbonic Acid	51·00	49·00.
Water	1·60	3·00.

It occurs at Hrubschitz in Moravia, in the Gulsen mountain in Stiria, at Baumgarten in Silesia, at Baudissero in Piedmont, in Spain, and in other countries. The *Magnesian Marble* of Mr NUTTAL, from Hoboken in New Jersey, which has been found both massive and crystallised in six-sided prisms, seems to possess some analogy with Magnesite.

MANGANESE-SPAR.

SPAR.

Manganese-Spar. JAM. Syst. Vol. II. p. 445. Man. p. 325.
Siliciferous Oxide of Manganese. PHILL. p. 245.

Prismatic. Cleavage apparent in two directions perpendicular to each other, less distinct in two

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others forming an angle of 87° 5′, according to ROSE, being the angle of Pyroxene.

Massive. Composition fine granular, strongly coherent.

Lustre intermediate between pearly and resinous. Colour rose-red. Translucent on the edges.

Brittle. Hardness = 5·0 ... 5·5. Sp. Gr. = 3·538, BERZELIUS; = 3·685, BREITHAUPT.

Heated before the blowpipe, it becomes dark-brown, and melts into a reddish-brown globule. The colour it imparts to glass of borax in the oxidating flame is hyacinth-red; but in the reducing flame the glass remains white. According to LAMPADIUS and BERZELIUS, it consists of

	From Siberia.	*From Sweden.*
Oxide of Manganese	61·00	54·42.
Silica	30·00	48·00.
Oxide of Iron	5·00	a trace.
Alumina	2·00	0·00.
Lime and Magnesia	0·00	3·34.

It is found at Longbanshyttan in Sweden in beds of iron-ore, near Elbingerode in the Hartz, and in the district of Catharinenburg in Siberia; also near Callington in Cornwall, and other places.

The substances called *Allagite*, *Corneous Manganese*, *Photizite* and *Rhodonite*, appear to be compact varieties of the present species, occasionally mixed with a variable quantity of the macrotypous Parachrose-baryte. They have been analysed, the first by DU MENIL, the others by BRANDES, and found to consist of

	Allagite.	Corn. Mang.	Photizite.	Rhodonite.
Oxide of Manganese	75·00	57·16	37·39	49·87.
Silica	16·00	35·00	36·00	39·00.
Carbonic Acid	7·50	5·00	14·00	4·00.
Water	0·00	2·50	6·00	6·00.
Oxide of Iron	0·00	0·25	0·50	0·25.
Alumina	0·00	0·00	6·00	0·12.

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The manganese in Allagite is in the state of peroxide, in all the rest it is protoxide.

They agree very nearly with the Manganese-spar in respect to hardness and specific gravity. Their colours are several green, brown, and reddish tints, which become darker on the surface on being exposed to the air, and generally assume at the same time a slight degree of lustre. They differ in a more or less perfect conchoidal fracture and slight shades of colour, which hardly allow of being expressed in words. They have all been found near Rübeland in the Hartz.

MARMOLITE.

Marmolite. NUTTALL. Silliman's Journal.

Massive. Cleavage in two directions, intersecting each other obliquely, one of them more distinct. Composition columnar.

Lustre pearly (inclining to metallic). Colour pale, green and grey. Opake.

Brittle. Easily cut with a knife. Sp. Gr. = 2·47, NUTTALL.

It is said to resemble very much prismatic Talc-mica, with which it had hitherto been confounded. Before the blowpipe it decrepitates, hardens, and splits into laminæ, but does not melt. With nitric acid it yields a thick partly gelatinous mass. It consists, according to NUTTALL, of

Magnesia	46·00.
Silica	36·00.
Lime	2·00.
Water	15·00.
Oxide of Iron and Chrome	0·50.

It occurs in serpentine at Hoboken, and in the Barehills near Baltimore.

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MASCAGNINE OR SULPHAT OF AMMONIAC.

SALT.

Mascagnine or Sulphat of Ammoniac. JAM. Syst. Vol. III. p. 16. Man. p. 13.

Prismatic, according to MITSCHERLICH. Stalactitic: composition impalpable. Mealy efflorescence. Colour yellowish-grey, lemon-yellow. Semi-transparent ... opake.
Taste pungent, bitter.

It is soluble in double its weight of water. It attracts moisture from the atmosphere, and is entirely volatile in a higher temperature. It consists of

Sulphuric Acid	53·29.
Ammonia	22·80.
Water	23·91.,

and its formula is $\dot{N}H^6\ddot{S} + 2$ Aq, according to BERZELIUS. It occurs in the neighbourhood of Vesuvius and Etna, in the Solfatara near Puzzuolo, and in the Lagunes near Siena in Tuscany.

MELLILITE.

Mellilite. JAM. Man. p. 325. Mellilite. PHILL. p. 208.

Prismatic. $P + \infty = 115°$. $\breve{P}r = 70°$ (nearly). HAÜY. According to PHILLIPS, they are square prisms, having the lateral edges replaced.
Colour yellow, inclining to red or green. Opake. Gives sparks with steel.

Before the blowpipe it melts without ebullition into a greenish glass. Reduced to powder, it gelatinises with nitric acid. According to CARPI, it consists of

Silica	38·00.
Lime	19·60.

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Magnesia	19·40.
Alumina	2·90.
Oxide of Iron	12·10.
Oxide of Titanium	4·00.
Oxide of Manganese	2·00.

It is found at Capo di Bove and Tivoli near Rome, accompanied by rhombohedral Feld-spar, in the fissures of a volcanic rock.

MESOLE.

KOUPHONE-SPAR.

Mesole. BERZELIUS. Edinb. Phil. Journ. Vol. VII. p. 7.

Implanted globules, reniform shapes: composition broad columnar, radiating from the centre.

Colour white, sometimes inclining a little to yellow. Faintly translucent.

Hardness = 3·5. Sp. Gr. = 2·370.

According to BERZELIUS, it consists of

Silica	42·60.
Alumina	28·00.
Lime	11·43.
Soda	5·63.
Water	12·70.

It contains generally a little carbonate of lime. BERZELIUS gives the formula $NS^2 + 2\,CS^2 + 9\,AS + 8\,Aq$.

It is found in Faroe lining the cavities of an amygdaloidal rock, the first stratum being generally Mesoline, the second Mesole, and having crystals of pyramidal and prismatoidal Kouphone-spar disposed upon it.

MESOLINE.

KOUPHONE-SPAR.

Mesoline. BERZELIUS. Edinb. Phil. Journ. Vol. VII. p. 7.

Crystalline coats of a whitish colour on the surface

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of the amygdaloid from Faroe, containing the Mesole and the pyramidal and prismatoidal Kouphone-spars.

This is probably a variety of Chabasie, which is found along with the other species in the above mentioned specimens. The following table contains the analyses of, 1. Mesole by BERZELIUS, 2. Chabasie from Fassa by ARFVEDSON, 3. Chabasie from the Giants Causeway by ARFVEDSON, and 4. Chabasie from Gustafsberg by BERZELIUS.

	1.	2.	3.	4.
Silica	47·50	48·38	49·07	50·65.
Alumina	21·40	19·28	18·19	17·90.
Soda	4·80	0·00	12·19	0·00.
Potash	0·00	2·50	a trace.	1·70.
Lime	7·90	8·70	0·00	9·73.
Water	18·19	21·14	19·73	19·90.

BERZELIUS observes that the Mesole was not quite pure, but had a little of the rock attached to it. These analyses, together with those of the other varieties of rhombohedral Kouphone-spar and of Gmelinite, differ only in the kind and proportions to each other of the alkaline base which they contain. The substances themselves are not, all of them, sufficiently known, to say whether, as it is probable, this difference is founded in really different natural-historical species, as in the case of prismatic Feld-spar, Albite, and Labradorite, or whether they should be comprised in one species.

MOLYBDENA-SILVER.

Molybdena-Silver. JAM. Man. p. 326. Molybdic Silver. PHILL. p. 287.

Rhombohedral. Cleavage, R, perfect.
Lustre metallic. Colour pale steel-grey.
Elastic. Not particularly sectile. Soft. Sp. Gr. = 8·0., BREITHAUPT.

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Before the blowpipe it melts very easily into a globule, that can be entirely volatilised, during which the supporting charcoal is covered with a yellow oxide. If dissolved in the state of powder in nitric acid, a precipitate of sulphur is formed. It consists, according to KLAPROTH, of

Bismuth 95·00.
Sulphur 5·00.

It has been found at Deutsch Pilsen in Hungary, accompanied by several species of the genera Lime-haloide, Iron-pyrites, &c.

It seems that in Hungary several species, different from each other, have been designated by the collective undetermined name of *Molybdena-Silver*. Thus a species very distinct from that described above, presents the following characters:

Form probably rhombohedral. It occurs in imbedded masses, having a general resemblance to three and six-sided prisms.

Cleavage perfect, axotomous. Fracture imperfect conchoidal, uneven, scarcely perceptible.

Lustre metallic. Colour intermediate between tin-white and steel-grey. Streak unchanged, or rather darker, its place becomes shining in the mineral. Opake.

Very sectile. Thin laminæ perfectly flexible. Hardness = 1·5. Sp. Gr. = 7·403.

This species likewise is found in Hungary. Several specimens of it are in the collection of the Johanneum at Gratz. It is accompanied by hexahedral Gold and pyramidal Copper-pyrites, imbedded in rhombohedral Quartz. Its chemical compounds are as yet unknown. Before the blowpipe it gives the reactions of sulphur, tellurium, and bismuth.

Another variety of Molybdena-Silver examined by BERZELIUS, which had been communicated to him by Professor WEISS of Berlin, was found to contain only tellurium and bismuth.

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NATIVE LEAD.

METAL.

Gediegen-Blei. LEONH. S. 223. Plomb natif. BOURNON. Cat. p. 333.

Massive. Fracture hackly.

Lustre metallic. Colour pure lead-grey. Streak shining.

Malleable. Hardness = 1·5. Sp. Gr. = 11·3523, HAÜY. Disagreeable odour by friction.

It melts easily before the blowpipe, and covers the charcoal with a yellow oxide. Octahedral crystals may be obtained by fusion. Metallic lead, as it occurs in nature, is almost in every instance accompanied by such substances as betray its having once been in a state of fusion. It was first noticed by RATHKE from the island of Madeira, where it is imbedded in vesicular masses, considered as slags by some, and as volcanic rocks by others. Many other localities are of a similar kind. It has been found in a rolled mass of a stone weight in Anglaise river, North America, traversing hexahedral Lead-glance in narrow veins. It has been quoted also from some abandoned mines in the vicinity of Carthagena in Spain, as occurring in capillary and other imitative shapes, engaged in a blackish clay. Lately metallic lead has also been found near Alston in Cumberland. It is associated with hexahedral Lead-glance, rhombohedral Quartz, &c., but also with litharge, and a fused mass resembling a slag. It fills a vein near the surface of the earth, in compact limestone.

NATIVE NICKEL.

Native Nickel. JAM. Syst. Vol. III. p. 559. Man. p. 326. Native Nickel. PHILL. p. 282.

Delicate, capillary crystals.

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Lustre metallic. Colour brass-yellow, inclining to bronze-yellow and steel-grey.

According to ARFVEDSON, it consists of

Nickel	64·35.
Sulphur	34·26.

Before the blowpipe it melts into a brittle metallic globule; it colours glass of borax violet-blue; in nitric acid it is dissolved without leaving a residue, and forms a pale green solution. It occurs at Johanngeorgenstadt in Saxony, Joachimsthal in Bohemia, and in the Westerwald, accompanied by several species of Iron-pyrites, Lime-haloide, &c. It has been sometimes called *Capillary Pyrites.*

NEEDLE-ORE.

GLANCE.

Needle-Ore. JAM. Man. p. 326. Acicular Bismuth-Glance. Syst. Vol. III. p. 381. Plumbo-cupriferous Sulphuret of Bismuth. PHILL. p. 274.

Prismatic. Cleavage unknown, imperfect. Fracture uneven.

Lustre metallic. Colour blackish lead-grey.

Hardness = 2·0 ... 2·5. Sp. Gr. = 6·125, JOHN.

Before the blowpipe its sulphur is driven off, and it melts and emits numerous sparkling metallic globules. A button of lead containing copper remains, which communicates a greenish-blue colour to glass of borax. It is soluble in nitric acid, and consists, according to JOHN, of

Bismuth	43·20.
Lead	24·32.
Copper	12·10.
Nickel	1·58.
Tellurium	1·32.
Sulphur	11·58.
Gold	0·79.

It occurs near Catharinenburg in Siberia, imbedded in

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rhombohedral Quartz, and accompanied by hexahedral Gold, and several species of the orders Malachite, Glance, and Pyrites.

NEPHRITE.

Nephrite. JAM. Syst. Vol. III. p. 287. Man. p. 327.
Nephrite. PHILL. p. 134.

Massive: composition impalpable. Fracture coarse splintery, in some varieties slaty in the great.

Colour green, particularly leek-green passing into grey and white. Translucent, often only on the edges.

Not particularly brittle; some varieties are remarkably tough. Hardness = 7·0. Sp. Gr. = 2·932 ... 3·024, BREITHAUPT.

Alone it is infusible before the blowpipe, but becomes white. It consists, according to KASTNER, of

Silica	50·50.
Magnesia	31·00.
Alumina	10·00.
Oxide of Iron	5·50.
Oxide of Chrome	0·05.
Water	2·75.

It is brought from China and Egypt. A large block has lately been found in the alluvial soil of the alum-earth mines at Schwemmsal in Saxony.

NICKELIFEROUS GREY ANTIMONY.

PYRITES.

Nickeliferous Grey Antimony. JAM. Syst. Vol. III. p. 403. Man. p. 327.

Tessular. Cleavage, hexahedron, perfect. Massive: composition granular.

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Lustre metallic. Colour steel-grey, inclining to silver-white.

Brittle. Hardness = 5·0 ... 5·5. Sp. Gr. = 6·451, a cleavable variety.

It is partly volatilised before the blowpipe, during which the supporting charcoal is covered with a white coating; at last it melts into a metallic globule, which communicates a blue colour to glass of borax. It consists, according to STROMEYER and KLAPROTH, of

Nickel	36·60	25·25.
Antimony	43·80	47·75.
Arsenic	0·00	11·75.
Sulphur	17·71	15·25.
Iron and Manganese	1·89	0·00.

It is met with in several mines in the principality of Nassau, along with brachytypous Parachrose-baryte, pyramidal Copper-pyrites, hexahedral Lead-glance, &c.

NITRATE OF SODA.

SALT.

Soude nitratée. HAÜY. Traité, 2de Ed. T. II. p. 214.
Nitrate of Soda. PHILL. p. 191.

Fundamental form. Rhombohedron. R = 106° 33′. Vol. I. Fig. 7. AP.

$$a = \sqrt{2{\cdot}05}.$$

Simple form. $\overset{*}{R}$.

Char. of Comb. and the combinations not observed.

Cleavage, R, perfect. Fracture conchoidal, almost imperceptible. Surface smooth.

Lustre vitreous. Colour white. Streak white. Transparent.

Rather sectile. Hardness = 1·5 ... 2·0. Sp. Gr. = 2·0964, KLAPROTH. Taste cooling.

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It is soluble in three times its weight of water at a temperature of 12° R. It melts and deflagrates upon glowing charcoal, but not so violently as the prismatic Nitre-salt. If rubbed in an isolated state, it acquires a very strong negative electricity. It consists of

Nitric Acid 54·97.
Soda 45·03.

according to BERZELIUS' formula, $\ddot{N}a\,\ddot{N}^2$.

It is found in Peru, in the district of Atacama, near the seaport of Yquique, and according to MARIANO DE RIVERO, occurs with clay in beds of different thickness, extending more than fifty miles, and is worked to great advantage.

NUTTALLITE.

Nuttallite. BROOKE. Ann. of Phil. XLI. p. 366.

Crystals, right square prisms, imbedded in calcareous spar. Resembling Scapolite, but softer and more glassy in the fracture. Play of light similar to that of Elaolite upon the faces of the prism. Colour grey.

ORTHITE.

Orthit. BERZELIUS. Afh. i Fysik, &c. Vol. V. Orthite. PHILL. p. 265.

Form, long and straight acicular masses. Massive: composition impalpable. Fracture conchoidal.

Lustre vitreous. Colour ash-grey, passing into brown, if the mineral be decomposed. Streak brownish-grey. Opake.

Scratches glass, though with difficulty. Sp. Gr. = 3·288, BERZELIUS.

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Before the blowpipe it froths, becomes yellowish-brown, and melts with effervescence into a black vesicular globule; with borax into a transparent one. It gelatinises in heated acids, and according to BERZELIUS, it consists of

Silica	32·00.
Lime	7·84.
Alumina	14·80.
Oxide of Cerium	19·44.
Protoxide of Iron	12·44.
Oxide of Manganese	3·40.
Yttria	3·44.
Water	5·36.

It occurs at Finbo near Fahlun in Sweden, along with rhombohedral Quartz, prismatic Feld-spar, Albite, &c. in veins traversing gneiss.

PALLADIUM.

METAL.

Palladium. JAM. Syst. Vol. III. p. 53. Native Palladium. PHILL. p. 325.

Grains. Octahedrons and prisms with a square base are quoted by SOWERBY.

Lustre metallic. Colour steel-grey, inclining to silver-white.

Hardness superior to wrought iron. Sp. Gr. = 11·8, WOLLASTON; = 12·14, LOWRY.

It is reducible by heat. By itself it is infusible before the blowpipe, but melts with sulphur. With nitric acid it yields a red solution. It consists essentially of palladium, but contains also a small portion of platina and iridium. It occurs along with native Platina in Brazil, and was discovered by Dr WOLLASTON. The pure metal is ductile and very malleable; it is flexible in thin slips, but not very elastic.

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PHARMACOLITE.

Pharmacolite. JAM. Syst. Vol. III. p. 543. Pharmacolite. Arseniate of Lime. PHILL. p. 178.

Capillary crystals, in globular aggregation. Globular, reniform, botryoidal. Composition thin columnar ... impalpable. Farinaceous.

Lustre vitreous; also pearly in the thin columnar particles of composition. Colour white. Translucent ... opake.

Sectile, very soft. Sp. Gr. = 2·640, KLAPROTH.

Before the blowpipe it emits an arsenical odour, and melts with difficulty into a white enamel. In nitric acid it is dissolved without effervescence. According to KLAPROTH and JOHN, it consists of

	From Wittichen.	*From Andreasberg.*
Lime	25·00	27·28.
Arsenic Acid	50·54	45·68.
Water	24·46	23·36.

It is found in the principality of Fürstenberg, at Andreasberg in the Hartz, at Riechelsdorf in Hessia, and other places, in veins that also contain native Arsenic, several species of Cobalt-pyrites, &c.

The description of the *Picropharmacolite* of STROMEYER (*Untersuchungen*. Vol. I. p. 135.), does not differ from that given of the Pharmacolite. The only difference discovered between the two substances consists in a small quantity of magnesia which the former contains. It is composed of

Lime	24·646.
Magnesia	3·218.
Oxide of Cobalt	0·998.
Arsenic Acid	46·971.
Water	23·977.

It occurs in the cobalt mines of Riechelsdorf in Hessia, along with prismatic Hal-baryte.

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PHOSPHATE OF MANGANESE.

ORE.

Phosphat of Manganese. JAM. Syst. Vol. III. p. 408. Pitchy Iron-Ore. Id. ibid. Vol. III. p. 248. Phosphat of Manganese. Id. Man. p. 328. Phosphate of Manganese. PHILL. p. 248.

Pyramidal or prismatic. Massive: cleavage in three directions perpendicular to each other, one of them more distinct. Fracture small conchoidal.

Lustre resinous, inclining to adamantine. Colour blackish-brown. Streak yellowish-grey. Translucent on the edges. Opake.

Brittle. Hardness = 5·0 ... 5·5. Sp. Gr. = 3·439, VAUQUELIN; = 3·775, ULLMANN.

Before the blowpipe it melts easily into a black scoria, is readily dissolved in nitric acid without effervescence, and consists, according to VAUQUELIN, of

Oxide of Iron	31·00.
Oxide of Manganese	42·00.
Phosphoric Acid	27·00.

It has been found near Limoges in France, in a vein of quartz traversing granite, accompanied by rhombohedral Emerald.

PICROLITE.

Picrolith (of Hausmann). LEONH. S. 545. Picrolite. PHILL. p. 209.

Massive: composition thin columnar. Fracture splintery.

Lustre faint, inclining to pearly. Colour leek-

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green passing into yellow. Streak a little shining. Translucent on the edges.

Hardness between 3·0 and 6·0.

According to ALMROTH, it consists of

Silica	40·04.
Magnesia	38·80.
Water	9·08.
Protoxide of Iron	8·28.
Carbonic Acid	4·70.

It colours glass of borax green, but the colour disappears on cooling. It occurs in irregular veins in the beds of octahedral Iron-ore in the Taberg, and at Nordmarken in Sweden, and has been mentioned also from Reichenstein in Silesia.

PICROSMINE.*

Picrosmin. HAIDINGER.

Fundamental form. Scalene four-sided pyramid. P = 151° 3′, 120° 0′, 67° 59′. Vol. I. Fig. 9. AP.

$$a : b : c = 1 : \sqrt{11{\cdot}00} : \sqrt{2{\cdot}75}.$$

Simple forms and combinations not known; the character of the latter prismatic, as it appears from cleavage.

Cleavage. $\breve{P}r + \infty$ (*M*) perfect; $\bar{P}r + \infty$ (*T*) less, $\bar{P}r$ (*i*) = 117° 49′ still less distinct. Least of all P + ∞ (*s*) = 126° 52′. The product of all the faces of cleavage is represented by Fig. 25. excepting the faces *o*.

Fracture uneven, scarcely perceptible.

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* Name derived from πικρὸς, bitter, and ὀσμὴ, odour, from the bitter and argillaceous odour the mineral exhales when humected.

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Lustre pearly, distinct upon P̆r + ∞, inclining to vitreous upon the other faces. Colour greenish-white, passing into greenish-grey, and mountain-green, sometimes also oil-, leek-, and blackish-green. Streak white, dull. Translucent on the edges ... opake.

Very sectile. Hardness = 2·5 ... 3·0. Sp. Gr. = 2·660 of a cleavable compound variety, 2·596 of a columnar variety.

Compound Varieties. Massive: composition granular, strongly coherent. If the composition becomes impalpable, the fracture is earthy. The particles of columnar compositions are very thin; fracture splintery.

Its chemical composition is unknown. Before the blow-pipe it is infusible, but gives out water, becomes first black, then white and opake, and acquires a degree of hardness nearly = 5·0. It is soluble in salt of phosphorus, with the exception of a silica skeleton. When heated with solution of cobalt, it assumes a pale red colour. It appears therefore to contain water, silica, and magnesia.

The cleavable varieties have been found, accompanied by octahedral Iron-ore and macrotypous Lime-haloide, in a bed in primitive rocks. The only locality hitherto known is the iron mine called Engelsburg near Presnitz in Bohemia.

It is likely that many varieties of the common Asbestus of WERNER, (JAM. Syst. Vol. II. p. 156.), particularly that from Zöblitz in Saxony, should be referred to this species. According to WIEGLEB, it consists of

Silica	46·66.
Magnesia	48·45.
Oxide of Iron	4·79.

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Various localities are quoted for the common Asbestus; but since Asbestus contains also varieties of hemi-prismatic and of paratomous Augite-spar, they cannot all be supposed exact, and it would therefore be very interesting to institute a closer natural-historical examination of all these minerals. Among the localities chiefly quoted, are Zöblitz in Saxony, Silesia, the Tyrol, and many other countries along the line of the Alps, the Shetland isles, Portsoy, &c. where it occurs in veins traversing serpentine; in the Taberg and other places in Sweden, where it occurs in beds, along with octahedral Iron-ore, with several species of Pyrites, rhombohedral and macrotypous Lime-haloide, &c.

PINITE.

Pinite. JAM. Syst. Vol. II. p. 227. Man. p. 328. Pinite. PHILL. p. 80.

Rhombohedral. $R - \infty$. $R + \infty$; $R - \infty$. $R + \infty$. $P + \infty$. Cleavage very indistinct. Composition, $R - \infty$. Fracture uneven.

Lustre resinous, faint. Colour blackish-green ... greenish-grey. Streak uncoloured. Feebly translucent on the edges.

Sectile. Hardness = 2·0 ... 2·5. Sp. Gr. = 2·782, the crystallised variety from France.

In thin splinters the variety from Auvergne melts imperfectly before the blowpipe, and consists, according to C. G. GMELIN, of

Silica	55·964.
Alumina	25·480.
Potash	7·890.
Soda	0·386.
Oxide of Iron	5·512.
Magnesia	3·760.
Water	1·410.,

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with traces of lime, manganese, and animal matter. According to KLAPROTH, the variety from Saxony is infusible before the blowpipe, and consists of alumina 63·75, silica 29·50, and protoxide of iron 6·75.

It occurs in several countries in granite; at Schneeberg in Saxony, in Salzburg, in Auvergne, in Cornwall, in North-America, &c.

PLOMBGOMME.

Plomb hydro-aluminé (Plomb gomme). HAÜY. Traité, 2de Ed. T. III. p. 410.

Reniform. Surface smooth. Composition thin columnar ... impalpable.

Colour yellowish- and reddish-brown, striped. Translucent.

Scratches octahedral Fluor-haloide, but does not affect glass.

If rubbed in an isolated state, it acquires a strong negative electricity. If quickly heated before the blowpipe, it decrepitates and loses its water; but is infusible by itself. With borax it yields a transparent colourless glass, without reduction of the lead. According to BERZELIUS, it consists of

Oxide of Lead	40·14.
Alumina	37·00.
Water	18·80.
Sulphurous Acid	0·20.
Lime and the Oxides of Iron and Manganese	1·80.
Silica	0·60.

It occurs at Huelgoet near Poullaouen in Brittany, in clay-slate, along with hexahedral Lead-glance, dodecahedral Garnet-blende, hexahedral Iron-pyrites, and di-prismatic Lead-baryte.

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POLYHALITE.

SALT.

Polyhalit. STROMEYER. Untersuchungen. Vol. I. p. 144. Polyhalite. PHILL. p. 199.

Massive: composition columnar. Fracture splintery, uneven.

Lustre resinous. Colour smoke-grey and pearl-grey, flesh-red and brick-red.

Hardness greater than 3·0. Sp. Gr. = 2·7689, STROMEYER.

Taste saline and bitter.

In the flame of a candle it melts into an opake globule, is readily dissolved in water, and, according to STROMEYER, consists of

Sulphate of Potash	27·7037.
Anhydrous Sulphate of Lime	44·7429.
Anhydrous Sulphate of Magnesia	20·0347.
Muriate of Soda	0·1910.
Water	5·9535.
Peroxide of Iron	0·3376.

It occurs at Berchtesgaden and Ischel, along with hexahedral Rock-salt, and the two species of Gypsum-haloide. It has lately been discovered also in the salt mines of Vic in Lorraine.

PYRALLOLITE.

Pyrallolith. NORDENSKIÖLD. Schweiggers Journal für Chemie and Physik. XXXI. 387. Pyrallolite. PHILL. p. 68.

Tetarto-prismatic. Comb. *l. M. T.* Sim. Fig. 81. Inclination of *M* on *T* = 94° 36′; of *l* on *M* = 140° 49′.

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Cleavage, distinct parallel to *M* and to *T*, also in the direction of a plane which takes away the more obtuse edge between *M* and *T*; this plane intersects *M* at an angle of 144° 3′, and *T* at an angle of 130° 33′.

Massive: composition granular. Fracture earthy. Lustre resinous. Colour white, sometimes greenish. Translucent on the edges ... opake.

Hardness = 3·5 ... 4·0. It seems to become harder by exposure to the air. Sp. Gr. = 2·55 ... 2·60.

When reduced to powder it phosphoresces with a blueish light. Before the blowpipe it first becomes black, then white, afterwards intumesces and melts on its edges. With borax it yields a transparent glass. According to NORDENSKIÖLD, from whom the whole of the preceding description is taken, it consists of

Silica	56·62.
Magnesia	23·38.
Alumina	3·38.
Lime	5·58.
Oxide of Iron	0·99.
Protoxide of Manganese	0·99.
Water	3·58.

leaving 6·38 of an unknown bituminous substance and loss. It occurs at Storgard in the parish of Pargas in Finland, with several species of the genera Feld-spar and Augite-spar; also with prismatic Titanium-ore and rhombohedral Lime-haloide.

PYRORTHITE.

Pyrorthit. BERZELIUS. Afhandl. i Fysik, &c. Vol. V.
Pyrorthite. PHILL. p. 265.

Probably prismatic. Massive: composition columnar. Fracture conchoidal, splintery, earthy.

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Lustre resinous. Colour brownish-black; if decayed, yellowish-brown. Streak brownish-black. Opake. Is scratched by rhombohedral Lime-haloide. Sp. Gr. = 2·19, BERZELIUS.

If gently heated on one side, it takes fire, and burns without either flame or smoke; after which it becomes white, and melts into a black enamel. It gives a transparent glass with borax, is soluble in heated acids with the exception of a black powder, and consists, according to BERZELIUS, of

Silica	10·43.
Alumina	3·59.
Protoxide of Cerium	13·92.
Protoxide of Iron	6·08.
Yttria	4·87.
Lime	1·81.
Protoxide of Manganese	1·39.
Water	26·50.
Carbon	31·41.

It has been found at Kärarf near Fahlun in Sweden, in a kind of granite, accompanied by prismatic Gadolinite.

PYROSMALITE.

MICA.

Pyrosmalite. JAM. Syst. Vol. III. p. 561. Man. p. 329.
Pyrosmalite. PHILL. p. 235.

Rhombohedral. Combination, R — ∞. R + ∞. Cleavage, R — ∞ perfect; R + ∞ less distinct. Fracture uneven.

Lustre pearly upon R — ∞; lower degrees of vitreous lustre in other directions. Colour pale liver-brown, passing into grey and green. Streak paler than the colour. Translucent ... opake.

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Rather brittle. Hardness = 4·0...4·5. Sp. Gr. = 3·077, HAUSMANN.

Before the blowpipe it becomes reddish-brown, and developes fumes of muriatic acid. In a strong fire it melts first into a black scoria, and then into a globule, which is attractable to the magnet. It is easily soluble in glass of borax, and consists, according to HISINGER, of

Silica	35·850.
Protoxide of Iron	21·810.
Protoxide of Manganese	21·140.
Muriate of Iron, with excess of base	14·095.
Lime	1·210.
Water	5·895.

It was discovered by Messrs GAHN and CLASON, in the iron-mines of Nordmark in Wermeland in Sweden, and is associated with rhombohedral Lime-haloide and paratomous Augite-spar.

The forms of Pyrosmalite are considered by HAÜY as belonging to the prismatic system. It will probably be found to belong to the genus Pearl-mica.

RADIATED ACICULAR OLIVENITE.

Radiated Acicular Olivenite. JAM. Syst. Vol. II. p. 335.
Oblique Prismatic Arseniate of Copper. PHILL. p. 318.

Hemi-prismatic. Form frequently similar to Fig. 44. having the most acute solid angles replaced by a face c'. Inclination of M on $M = 56° 0'$, of P on $M = 95° 0'$, of P on c' (contiguous to the same summit) $99° 30'$, according to PHILLIPS.

Lustre pearly upon the face of perfect cleavage. Colour dark verdigris-green, inclining to sky-blue, still darker on the surface. Streak verdigris-green. Translucent on the edges.

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Not very brittle. Hardness = 2·5...3·0. Sp. Gr. = 4·192.

Before the blowpipe it deflagrates, and emits arsenical vapours. According to CHENEVIX, it consists of

Oxide of Copper	54·00.
Arsenic Acid	30·00.
Water	16·00.

It has hitherto been found only in Cornwall, with several other species of the order Malachite, also with pyramidal Copper-pyrites, rhombohedral Quartz, &c.

RED VITRIOL OR SULPHATE OF COBALT.

SALT.

Red Vitriol or Sulphate of Cobalt. JAM. Syst. Vol. III. p. 23. Man. p. 15. Red Vitriol. Sulphat of Cobalt. PHILL. p. 282.

Hemi-prismatic. Similar to the forms of the hemi-prismatic Vitriol-salt, MITSCHERLICH. Stalactitic and coralloidal shapes: composition columnar, in most cases impalpable. Friable.

Lustre vitreous; in very thin columnar compositions it becomes pearly. Colour flesh-red and rose-red ... reddish-white. Semi-transparent ... translucent.

Taste astringent.

It is soluble in water. To glass of borax it communicates a blue colour. According to KOPP, it consists of

Oxide of Cobalt	38·71.
Sulphuric Acid	19·74.
Water	41·55.

It occurs in the rubbish of old mines, at Bieber in the neighbourhood of Hanau.

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RETINITE.

RESIN.

Retinite. JAM. Syst. Vol. III. p. 478. Retinasphalt. PHILL. p. 375.

Roundish, and blunt-edged masses. Fracture conchoidal.

Lustre resinous. Colour green, yellow, red, brown, sometimes in striped delineation. Semitransparent ... opake.

Hardness = 1·5 ... 2·0, of the variety from Halle. Sp. Gr. = 1·135, HATCHETT.

The Retinite from Halle very much resembles a vegetable resin. The purer specimens frequently consist of alternating layers more or less transparent, corresponding to the external shape, and commonly including a cavity.

It emits a strong peculiar odour, even in its natural state, but still more powerfully if rubbed between the fingers; which odour they retain for a considerable time. Its specific gravity is = 1·079.

Retinite, if rubbed in an isolated state, acquires negative electricity. It takes fire at the flame of a candle, melts, and burns with a particular odour. It is partly soluble in alcohol, leaving behind an unctuous residue. According to HATCHETT and BUCHOLZ, it consists of

Vegetable Resin	55·00	91·00.
Asphalt or Bitume	42·00	9·00.
Earthy Matter	3·00	0·00.

It has been found in the beds of earthy brown coal near Halle on the Saale, at Bovey in Devonshire, also in Upper Austria, Moravia, &c.

The different substances called Retinite, Retin-Asphalt, &c. deserve an accurate comparative examination.

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ROSELITE.

HALOIDE.

Roselite. Lévy. Ann. of Phil. XLVIII. p. 439. Edinb. Journ. of Science. Vol. II. p. 177.

Prismatic. P = 114° 24′, 79° 15′, 140° 40′. Vol. I. Fig. 9. Lévy.

$$a : b : c = 1 : \sqrt{0{\cdot}1909} : \sqrt{0{\cdot}3761}.$$

Simple forms. P — ∞ (*P*); $\frac{5}{2}$ P̆r ($e^{\frac{4}{3}}$) = 45° 0′; P̄r (a^2) = 47° 12′; P̆r + ∞ (*g*).

Combination of all these forms represented Fig. 195. Inclination of edge *z* on edge *z* = 119° 46′.

Cleavage perfect parallel to P. Surface, P̄r rough, and hollowed out in the middle.

Lustre vitreous. Colour deep rose-red. Streak white. Translucent.

Hardness = 3·0.

According to Mr Children, it contains water, oxide of cobalt, lime, arsenic acid, and magnesia. Before the blowpipe it gives off water and becomes black. It imparts a blue colour to borax and salt of phosphorus, and is entirely soluble in muriatic acid. It occurs at Schneeberg in Saxony, disposed on rhombohedral Quartz, and was formerly considered as a variety of the prismatic Cobalt-mica, but seems rather to belong to the order Haloide.

SARCOLITE.

SPAR.

Sarcolithe de Thomson. Haüy. Traité, 2de Ed. T. III. p. 177.

Tessular. Combinations of the hexahedron and the octahedron, Vol. I. Fig. 3.

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Fracture presenting a vitreous tissue. Colour flesh-red. Hardness sufficient to scratch glass.

It is supposed by HAÜY to be a variety of the hexahedral Kouphone-spar; but the form of the octahedron having never yet been observed in that species, an accurate examination of Sarcolite is still a desideratum.

SAUSSURITE.

Saussurite. JAM. Syst. Vol. I. p. 71. Man. p. 182.
Saussurite. PHILL. p. 135.

Prismatic. Cleavage two faces meeting at angles of 124° nearly, pretty distinct. Traces parallel to the short diagonal of that prism. Fracture uneven splintery. Massive: composition granular ... impalpable, strongly coherent.

Lustre pearly, inclining to vitreous upon the faces of cleavage; resinous in compound varieties, particularly when cut and polished. Colour white, passing into mountain-green, greenish- and ash-grey. Streak white.

Brittle. Very difficultly frangible. Hardness = 5·5. Sp. Gr. = 3·256 of a granular variety from Piedmont, 3·342 of a compact variety from the Pays de Vaud.

Before the blowpipe it melts with difficulty into a white glass. According to SAUSSURE and KLAPROTH, it consists of

Silica	49·00	44·00.
Alumina	24·00	30·00.
Lime	10·00	4·00.
Magnesia	3·75. Potash	0·25.
Oxide of Iron	6·50	12·50.

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Oxide of Manganese	0·00	0·05.
Soda	5·50	6·00.
Loss	0·75	3·20.

Saussurite, or *Jade*, occurs in primitive mountains, and constitutes with several varieties of the species of paratomous and hemiprismatic Augite-spar, the rocks called gabbro and euphotide. It is found in large masses in the Monte Rosa, and in its neighbourhood; in Corsica; in the Bacher mountain in Lower Stiria, in Bayreuth, &c.

SCORODITE.

Skorodite. JAM. Syst. Vol. III. p. 547. Man. p. 329. Martial Arseniate of Copper. Skorodite. PHILL. p. 320. 321. Skorodit. BREITHAUPT.

Prismatic. P = 115° 6′, 102° 1′, 111° 34′. Vol. I. Fig. 9. AP.

a : b : c = 1 : √ 1·098 : √ 0·792.

Simple forms. P — ∞ (*k*); P — 1 = 134° 37′, 126° 25′, 72° 40′; P (*P*); (P̆r + ∞)³ (*d*) = 60° 58′; P̄r + 1 (*m*) = 47° 59′; P̄r + ∞; P̆r + ∞ (*r*).

Char. of Comb. Prismatic.

Comb. 1. P — ∞. P. Löling, Carinthia.

2. P — ∞. P. P̄r + 1. (P̆r + ∞)³. P̆r + ∞. Fig. 19. Löling.

3. P — 1. P. P̄r + 1. (P̆r + ∞)³. P̆r + ∞. P̄r + ∞. Saxony.

Cleavage. (P̆r + ∞)³ imperfect, traces of P̆r + ∞ and of P̄r + ∞. Fracture uneven. Surface; P uneven and irregularly streaked parallel to its own edges; P̆r + ∞, partly also (P̆r + ∞)³ in a vertical direction. The rest of the faces commonly very smooth and even.

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Lustre vitreous, inclining to adamantine on the surface, and to resinous in the interior. Colour principally leek-green, which passes almost into white, or also into olive-green and liver-brown. Streak white. Semi-transparent ... translucent on the edges.

Rather brittle. Hardness = 3·5 ... 4·0. Sp. Gr. = 3·162.

Before the blowpipe it emits an arsenical odour, and melts into a reddish-brown scoria, which acts upon the magnet, if it has been heated long enough to drive off all the arsenic. According to FICINUS, it consists of

Arsenious Acid	31·40.
Sulphuric Acid	1·54.
Water	18·00.
Protoxide of Iron, with Magnesia, Lime, and Manganese	47·30.

It occurs in primitive mountains at Schwarzenberg in Saxony with prismatic Arsenical-pyrites, at Löling near Hüttenberg in Carinthia with axotomous Arsenical-pyrites; it is accompanied in the latter place also by octahedral Bismuth and brachytypous Parachrose-baryte. Beautiful specimens have lately been brought from Brazil. It occurs in several of the Cornish mines. The Martial Arseniate of Copper from Cornwall seems to be merely a variety of the Scorodite. It consists, according to CHENEVIX, of oxide of copper 22·5, arsenic acid 33·5, oxide of iron 27·5, water 12·0, and silica 3·0.

SELENIURET OF COPPER.

Cuivre sélénié. HAÜY. Traité, 2de Ed. T. III. p. 469.
Seleniuret of Copper. PHILL. p. 304.

Massive; also superficial upon fissures in rhombohedral Lime-haloide.

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Lustre metallic. Colour silver-white. Streak shining.

Soft. Malleable.

It acquires negative electricity by friction. It melts easily upon charcoal into a grey malleable globule, giving out a strong smell of selenium, and consists of selenium and copper. It has been hitherto exclusively found in the Skrickerum copper mine, in Smaland in Sweden.

SERPENTINE.

Serpentine. JAM. Syst. Vol. II. p. 292. Man. p. 36.
Serpentine. PHILL. p. 97.

Prismatic. P = 139° 34′, 105° 26′, 88° 26′. Vol. I. Fig. 9. Ap.

$$a : b : c = 1 : \sqrt{4{\cdot}3} : \sqrt{1{\cdot}4}.$$

Simple forms. P (*P*); $(\breve{P}r)^5$ (*n*); $(\breve{P}r + \infty)^5$ (*d*) = 82° 27′; $\breve{P}r$ (*o*) = 128° 31′; $\breve{P}r + 1$ (*r*) = 92° 4′; $\breve{P}r + \infty$ (*b*); $\bar{P}r + \infty$ (*s*).

Char. of Comb. Prismatic.

Comb. 1. $\breve{P}r$. P. $(\breve{P}r + \infty)^5$. $\breve{P}r + \infty$. $\bar{P}r + \infty$. Sim. Fig. 25.

2. $\breve{P}r$. P. $\breve{P}r + 1$. $(\breve{P}r)^5$. $(\breve{P}r + \infty)^5$. $\breve{P}r + \infty$. $\bar{P}r + \infty$. Fig. 33.

Cleavage. Traces of $\breve{P}r + \infty$ and of $(\breve{P}r + \infty)^5$, apparent only in a strong light. Fracture flat conchoidal, splintery, uneven. Surface, almost dull, very little glistening, but rather even.

Lustre resinous, indistinct, low degrees of intensity. Colour dark blackish- and leek-green, seldom lighter shades of oil-green and siskin-green colours, none of them being bright; they pass into yel-

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lowish-grey. Streak white, acquires some lustre. Translucent ... opake.

Sectile. Hardness = 3·0. Sp. Gr. = 2·507 of a greenish-black crystallised variety; = 2·560 of an oil-green, translucent one.

Compound Varieties. Massive: composition granular, impalpable. Varieties of this kind present also red, brown, black, yellow, and grey colours, in different veined, spotted, and other delineations. The purer varieties sometimes possess an indistinct slaty structure.

The regular forms have been observed in a blackish-green variety, the locality of which is unknown. Serpentine is said to occur crystallised in the Tyrol. Imbedded crystals, the prismatic form of which, however, is nearly obliterated, occur in the weisstein of Penig in Saxony. Serpentine often contains crystals and grains of octahedral Iron-ore, which must be well attended to, if we determine its hardness and specific gravity.

Serpentine is generally divided into two subspecies, the *common* and *precious* Serpentine, the latter of which again comprises a *conchoidal* and a *splintery* kind, distinguished in colour, fracture, and transparency. It hardens on being exposed to fire, and melts only with great difficulty on the edges. According to JOHN, it consists of

Silica	42·50.
Magnesia	38·63.
Alumina	1·00.
Lime	0·25.
Oxide of Iron	1·50.
Oxide of Manganese	0·62.
Oxide of Chrome	0·25.
Water	15·20.

Serpentine forms mountain masses and beds in primitive

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rocks, and frequently contains crystals, grains, or compound nodules of various other species. Precious Serpentine, in particular, is often mixed with granular limestone. The different varieties of Serpentine are met with in Saxony, Silesia, Austria, Hungary, Stiria, Italy, Corsica, Sweden, in England and Scotland, and other countries. It is turned on the lathe into vases, and also worked into different ornaments.

SILLIMANITE.

SPAR.

Sillimanite. BOWEN. Journ. of the Acad. of Sc. of Philadelphia. Vol. III. p. 375.

Hemi-prismatic. It occurs crystallised in four-sided prisms of about 106° 30′, the inclination of the base on the axis being 113°.

Cleavage parallel to the long diagonal of the prism. Fracture, uneven, splintery. Surface often rounded, the crystals themselves bent.

Lustre, considerable upon the single face of cleavage. Colour dark grey, passing into clove-brown. Translucent on the edges.

Hardness, superior to quartz or even to topaz. Brittle and easily reduced to powder. Sp. Gr. = 3·410. Electricity or magnetism none.

It was found by BOWEN to contain

Alumina	54·111.
Silica	42·666.
Oxide of Iron	1·999.
Water	0·510.

It is infusible before the blowpipe, whether alone or with borax, and is not acted upon by acids. It occurs in the

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town of Saybrook, Connecticut, and was formerly considered as a variety of Anthopyllite. The analysis agrees exactly with that of prismatic Disthene-spar by KLAPROTH, (Vol. II. p. 215.). No exact crystallographic description is given, but the angle of 106° 30′ is very near the incidence of *P* on *M*, 106° 15′, in that species, also the specific gravity is not much different, and the great hardness may perhaps be accounted for by the want of a more general diffusion of correct methods for ascertaining this property. Sillimanite is therefore probably a variety of the prismatic Disthene-spar.

SOMERVILLITE.

Somervillite. BROOKE. Brande's Quarterly Journal. Vol. XVI. p. 274.

Pyramidal. P = 134° 48′, 65° 50′. Vol. I. Fig. 8. BROOKE.

Simple forms. $a = \sqrt{0{\cdot}419}$. P — ∞ (*P*); P (*a*); P + ∞ (*d*); [P + ∞] (*M*); (P + ∞)^3 (*e*) = 126° 52′ 12″, 143° 7′ 48″.

Combination of all these forms, resembling Fig. 101., having the apex, and the edges between *g* and *l* replaced.

Cleavage, P — ∞ perfect, none observable parallel to the axis.

Lustre more glassy in the cross fracture than that of pyramidal Garnet. Colour pale dull yellow.

Hardness inferior to that of pyramidal Garnet.

It decrepitates before the blowpipe, and melts alone into a grey coloured globule, with borax into a colourless one. It occurs at Mount Vesuvius, associated with black mica and other minerals.

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SORDAWALITE.

Sordawalite. NORDENSKIÖLD. Edinb. Phil. Journ. Vol. IX. p. 162. Sordawalite. PHILL. p. 210.

Massive: composition impalpable; no trace of cleavage. Fracture conchoidal.

Lustre vitreous, inclining to semi-metallic. Colour greenish- or greyish-black. Opake.

Brittle. Hardness equal to that of glass. Sp. Gr. = 2·530, NORDENSKIÖLD.

It becomes reddish by exposure to the atmosphere. Before the blowpipe it forms with difficulty a blackish globule. With a small quantity of soda it yields a blackish-green globule; with a larger quantity a rough slaggy mass is produced. Borax dissolves it into a green glass. It is partly soluble in muriatic acid. Analysis by NORDENSKIÖLD:

Silica	49·40.
Alumina	13·80.
Peroxide of Iron	18·17.
Magnesia	10·67.
Phosphoric Acid	2·68.
Water	4·38.

It occurs near the town of Sordawala in Finland, in layers from half an inch to an inch in thickness in a primitive rock.

SPHÆRULITE.

Sphærulite. JAM. Syst. Vol. III. p. 545. Man. p. 330. Sphærulite. PHILL. p. 209.

Imbedded spheroidal masses. Surface of some of them smooth, of others rough. Composition columnar ... impalpable. In the latter case the fracture even, splintery.

Colour various shades of brown and grey. Translucent on the edges ... opake.

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Brittle. Hard (it scratches quartz slightly, BREITHAUPT). Sp. Gr. = 2·52 from Spechtshausen; = 2·40 from Hungary, BREITHAUPT.

Before the blowpipe it is almost infusible, only the edges become covered with a sort of enamel. It is said to be very nearly related to obsidian in respect to its composition. It occurs at Glashütte near Schemnitz in Hungary, imbedded in pearlstone, and at Spechtshausen near Tharand in Saxony, imbedded in pitchstone, both varieties of empyrodox Quartz. It was first distinguished by Mr BREITHAUPT.

SPINELLANE.

Spinellane. JAM. Syst. Vol. III. p. 549. Man. p. 331.
Spinellane. PHILL. p. 127.

Tessular form, the dodecahedron, sometimes combined with the hexahedron. PHILL. Grains. Cleavage, the dodecahedron, imperfect. Fracture conchoidal, uneven.

Lustre vitreous, inclining to resinous. Colour greyish-black, passing into ash-grey and brown. Sometimes a whitish play of light parallel to the faces of the hexahedron. Translucent ... opake. Hardness = 5·5 ... 6·0. Sp. Gr. = 2·282.

Before the blowpipe it is infusible, whether alone or with additions. According to KLAPROTH, it consists of

Silica	43·00.
Alumina	29·50.
Lime	1·50.
Soda	19·00.
Oxide of Iron	2·00.
Sulphur	1·00.
Water	2·50.

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It occurs on the shores of the lake of Laach, along with prismatic Feld-spar, hemi-prismatic Augite-spar, octahedral Iron-ore, &c. It resembles pitchstone when broken, and according to the observations of Dr BREWSTER, also in its structure, when examined in thin splinters by a powerful microscope. The name of *Nosin* has been given to it, in honour of Mr NOSE, its first discoverer.

STEATITE OR SOAPSTONE.

Steatite or Soapstone. JAM. Syst. Vol. II. p. 255. Man. p. 125. Soap-stone. PHILL. p. 118.

Crystals, chiefly of the rhombohedral system, and among these particularly such as resemble varieties of rhombohedral Quartz, and macrotypous Lime-haloide, the nature of which is as yet problematic. The crystals are found imbedded in the massive varieties of the same mineral. Massive; composition impalpable, fracture uneven, splintery.

Colour generally white, passing into grey, green, yellow, red. Streak having a faint resinous lustre. Translucent on the edges.

Perfectly sectile. Feels greasy. Does not adhere to the tongue. Soft ... very soft. Sp. Gr. = 2·604 ... 2·632, BREITHAUPT.

Before the blowpipe it is very difficultly fusible, and only partly vitrified. According to KLAPROTH, it consists of

	From Baircuth.	*From Cornwall.*
Silica	59·50	45·00.
Magnesia	30·50	24·75.
Alumina	0·00	9·25.
Oxide of Iron	2·50	1·00.
Water	5·50	18·00.

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It is met with at Wunsiedel and Göpfersgrün in Baireuth, in the Lizard district in Cornwall, in Saxony, in Piedmont, in Sweden, in China, &c., most commonly in veins, but also sometimes in imbedded irregular masses in serpentine.

STILPNOSIDERITE.

ORE.

Stilpnosiderite. JAM. Syst. Vol. III. p. 549. Man. p. 331.
Stilpnosiderite. PHILL. p. 227.

Small reniform and irregular dendritic shapes, massive. Composition impalpable. Fracture rather perfectly conchoidal.

Lustre resinous. Colour brownish-black, blackish-brown. Streak yellowish-brown. Feebly translucent on the edges ... opake.

Brittle. Hardness = 4·5. Sp. Gr. = 3·611, a reniform variety.

Before the blowpipe it becomes black, but is infusible. With borax it yields a dark olive-green glass, but is not melted itself. According to VAUQUELIN and ULLMANN, it consists of

Oxide of Iron	80·25	80·50.
Silica	3·75	2·25.
Water	15·00	16·00.
Oxide of Manganese	0·00	a trace.

From the observations of Mr FREIESLEBEN, relative to the process of smelting this ore, it appears that it also contains phosphoric acid.

It occurs at Scheibenberg and Raschau in Saxony, in the county of Henneberg, in Thuringia, in Nassau, in the Hartz, &c.

Stilpnosiderite is generally considered as a variety of prismatic Iron-ore; it possesses a stronger lustre, from which property the name has been derived.

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STROMNITE.

Bary-Strontianite or Stromnite. TRAILL. Trans. Roy. Soc. Edinb. Vol. IX. P. 1. p. 81. PHILL. p. 187.

Massive: composition thin columnar, and shewing traces of crystallisation.

Colour yellowish-white internally; on the outside, where it appears to be disintegrated, it is greyish-white. Lustre inclining to pearly, faint. Translucent.

Brittle. Hardness = 3·5. Scratches calc-spar, but not fluor-spar. Sp. Gr. = 3·703, TRAILL.

According to Dr TRAILL, it contains

Carbonate of Strontia	63·6.
Sulphate of Baryta	27·5.
Carbonate of Lime	2·6.
Oxide of Iron	0·1.

It effervesces with acids, but is infusible before the blow-pipe. It occurs in veins along with hexahedral Lead-glance, in a kind of clay-slate at Stromness in Orkney.

SULPHATE OF POTASH.

SALT.

Potasse sulfatée. HAÜY. Traité, 2de Ed. T. II. p. 187.

Prismatic. P = 131° 15′, 112° 32′, 87° 34′. Vol. I. Fig. 9. AP.

$$a : b : c = 1 : \sqrt{3{\cdot}06} : \sqrt{1{\cdot}69}.$$

Simple forms. $P - \infty$; P (*P*); $P + \infty = 106° 46'$; $(\breve{P}r)^3$ (*a*); $(\breve{P}r + \infty)^3$ (*d*) = 67° 52′; $\breve{P}r$ (*o*) = 120° 29′; $\frac{3}{4}\breve{P}r + 2 = 60° 30'$; $\breve{P}r + \infty$ (*p*); $(\breve{P}r + \infty)$ (*s*).

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Char. of Comb. Prismatic.

Combinations. 1. $\breve{P}r$. $\breve{P}r + \infty$. $\bar{P}r + \infty$. (*Pot. sulf. prismatique.* HAÜY.)

2. P. $(\breve{P}r + \infty)^3$. (*Pot. sulf. dodécaèdre.* HAÜY.) Sim. Fig. 7. without *s*.

3. $\breve{P}r$. P. $(\bar{P}r)^3$. $P + \infty$. $(\breve{P}r + \infty)^3$. $\breve{P}r + \infty$. $\bar{P}r + \infty$. Sim. Fig. 30., the edges between *d* and *s* being replaced by the faces of $P + \infty$. There is almost always regular composition parallel to one or both faces of $\breve{P}r$.

Cleavage, very indistinct, parallel to $\breve{P}r$ and $\bar{P}r + \infty$, the latter a little more apparent; Traces of $\breve{P}r + \infty$. Fracture imperfect conchoidal ... uneven. Surface; $(\breve{P}r + \infty)^3$, and partly also $P + \infty$ irregularly streaked parallel to their common edges of combination; the rest of the faces smooth.

Lustre vitreous, inclining to resinous. Colour white, yellowish or greyish, sometimes superficially greenish or blueish. Streak white, a little shining. Transparent ... translucent.

Rather brittle. Hardness = 2·5 ... 3·0. Sp. Gr. = 1·731. Taste saline and bitter, disagreeable.

Its chemical formula is $\ddot{K}\,\dddot{S}^2$, according to BERZELIUS, corresponding to

Sulphuric Acid	45·93.
Potash	54·07.

It occurs at Mount Vesuvius. The regular forms of this salt have been likewise ascertained to belong to the prismatic system, by Dr BREWSTER, and by Messrs BROOKE and LÉVY.

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TENNANTITE.

GLANCE.

Tennantite. JAM. Syst. Vol. III. p. 563. Man. p. 332.
Tennantite. PHILL. p. 304.

Semi-tessular, with inclined faces. Combinations similar to Fig. 158 ... 161; often in regular compositions, according to the law of Fig. 164. Cleavage dodecahedron, imperfect. Sometimes massive, composition granular ... impalpable. Fracture uneven.

Lustre metallic. Colour blackish lead-grey. Streak reddish-grey. Opake.

Brittle. Scratches prismatic and tetrahedral copper-glance, W. PHILL. Sp. Gr. = 4·375, R. PHILL.

The existence of the regular composition is most easily ascertained by the striæ upon the faces of the hexahedron, which are parallel to the edges of combination with one of the tetrahedrons.

Before the blowpipe Tennantite decrepitates a little, and burns with a blue flame, emitting copious arsenical vapours, and melting at last into a black scoria, which affects the magnetic needle. According to Mr R. PHILLIPS, it consists of

Copper	45·32.
Arsenic	11·84.
Iron	9·26.
Sulphur	28·74.
Silica	5·00.

It occurs in several of the Cornish copper mines, in veins traversing granite and clay-slate, and is accompanied by several ores of copper.

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THOMSONITE.

KOUPHONE-SPAR.

Thomsonite. BROOKE. Ann. of Phil. Vol. XVI. p. 193. THOMSON. Ibid. p. 408. PHILL. p. 39.

Prismatic. $P + \infty = 90° 40'$, BROOKE. Crystals elongated in the direction of the axis, having the apices engaged. Massive: composition columnar, radiating from common centres.

Cleavage, parallel to $\breve{P}r + \infty$, and $\bar{P}r + \infty$, forming a rectangular four-sided prism, very easily obtained. Fracture uneven. Surface smooth.

Lustre vitreous, much inclining to pearly. Colour white. Transparent ... translucent.

Brittle. Hardness = 5·0. Sp. Gr. = 2·37, BROOKE.

According to THOMSON and BERZELIUS, it consists of

Silica	36·80	38·30.
Alumina	31·36	30·20.
Lime	15·40	13·54.
Soda	0·00	4·53.
Magnesia	0·20	0·40.
Peroxide of Iron	0·60	0·00.
Water	13·00	13·10.

It intumesces before the blowpipe, and becomes snow-white and opake, but does not melt. It occurs with axotomous Triphane-spar, in the trap-rocks of Kilpatrick, near Dumbarton in Scotland.

THULITE.

SPAR.

Thulite. BROOKE. Crystallography, p. 494. PHILL. p. 211

Cleavage, parallel to the sides of a rhombic prism of 92° 30′ and 87° 30′.

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Colour rose-red. Streak greyish-white.
Scratched by quartz, and yielding to the knife with difficulty.

This mineral is very imperfectly described, as all the properties given do not suffice, if it be a particular species, to distinguish it from the Manganese-spar, at least by characters derived from the descriptions of the two substances. It occurs at Tellemarken in Norway with rhombohedral Quartz, octahedral Fluor-haloide, and Cyprine, which is said to be a cupriferous variety of pyramidal Garnet.

TIN-PYRITES.

GLANCE.

Tin-Pyrites. JAM. Syst. Vol. III. p. 325. Man. p. 332.
Tin Pyrites. Sulphuret of Tin. PHILL. p. 254.

Form probably tessular. Massive: composition granular, strongly coherent. Fracture uneven, imperfect conchoidal.
Lustre metallic. Colour steel-grey, inclining to yellow. Streak black. Opake.
Brittle. Hardness = 4·0. Sp. Gr. = 4·350, KLAPROTH.

In the collections of Mr RASHLEIGH of Menabilly, and Mr WILLIAMS of Scorrier, crystals of Tin-pyrites are preserved, having apparently the form of regular hexahedrons, but their surface is dull. The traces of cleavage, sometimes observed in massive varieties, seem likewise to be parallel to this form, and at the same time parallel to the dodecahedron.

Before the blowpipe sulphur is driven off, and the mineral melts into a blackish scoria, without yielding a metallic button. It is soluble in nitro-muriatic acid, during which

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the sulphur is precipitated. According to KLAPROTH, it consists of

Tin	34·00.
Copper	36·00.
Iron	2·00.
Sulphur	25·00.

It is found near St Agnes in Cornwall, with pyramidal Copper-pyrites, dodecahedral Garnet-blende, &c.

TORRELITE.

Torrelite. RENWICK. Ann. of Phil.

No description.

The analysis by Professor RENWICK gives

Silica	32·60.
Peroxide of Cerium	12·32.
Protoxide of Iron	21·00.
Alumina	3·68.
Lime	24·08.
Water	3·50.

It occurs in Sussex county, New Jersey.

TRONA.

SALT.

For Synonymes, *vide* Vol. II. p. 27. Trona. HAIDINGER, Edinb. Journ. of Science. Vol. II. p. 325.

Hemi-prismatic. Combinations observed resembling Fig. 75., without r. Inclination of M on $T = 103° 15'$, of n on n, adj. $= 132° 30'$, nearly.

Cleavage highly perfect, parallel to M, traces parallel to T and n. Fracture uneven. Surface, T often striated parallel to its edges of combination with M.

Lustre vitreous. Colour white, sometimes yellow-

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ish. Streak white. Transparent ... translucent. Index of refraction, ord. = 1·43., extr. 1·52. Hardness = 2·5 ... 3·0. Sp. Gr. = 2·112.

Compound Varieties. Thin columnar compositions of crystals lengthened between *M* and *T*; fracture radiated, owing to the longitudinal distinct face of cleavage.

The analysis of this mineral by KLAPROTH has been given above, Vol. II. p. 29., agreeing with BERZELIUS formula $\ddot{N}a\ \ddot{C}^3 + 4$ Aq, or 37·99 of soda, 40·15 carbonic acid, and 21·86 of water. It does not melt in its water of crystallisation, and is not altered by the influence of the atmosphere. It is formed on the banks of the natron lakes in Sukena, a province of the kingdom of Fezzan in Africa, in the shape of crystalline coats, and occurs also on the surface of the earth. It is exported from thence in considerable quantities under the name of *Trona*. The natural carbonate of soda from the lake of Merida in Columbia, probably also belongs to this species.

TUNGSTATE OF LEAD.

BARYTE.

Tungstate of Lead. PHILL. p. 350.

Probably pyramidal. Crystals acute four-sided pyramids and prisms in parallel position, contracted at the ends, and aggregated in bunches.

Lustre resinous. Colour yellowish-grey. Faintly translucent.

Before the blowpipe it melts and gives off vapours of lead, leaving a crystalline globule of a dark colour and metallic aspect, which yields a pale grey powder. When the lead has been driven off, it yields with borax a yellow

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globule, transparent and dark red on cooling, and with salt of phosphorus, at a certain degree of saturation, a blue one in the reducing flame. It occurs at Zinnwald in Saxony, associated with rhombohedral Quartz and Mica, and was first noticed as a particular species, and subjected to a chemical examination by Messrs BREITHAUPT and LAMPADIUS.

TURNERITE.

Turnerite. LÉVY. Ann. of Phil. XVIII. p. 241. PHILL. p. 382.

Hemi-prismatic. Combinations having the general appearance of the crystal of prismatic Azure-malachite, represented Fig. 66.

Measurements of the angles, according to LÉVY and PHILLIPS:

M on M (over i)	= 96° 10′.	h on c	= 142° 29′.
g on g (over i)	= 131° 50′.	c on a	= 92° 55′.
M on x	= 140° 50′.	h on a	= 124° 36′.
h on M (over x)	= 80° 20′.	a' on x	= 143° 30′.
h on M (over k)	= 99° 40′.	h on k	= 133° 50′.

There are moreover five prisms indicated in the situation of l, f, P, whose edges, contiguous to the face h, are 130° 34′, 98° 50′, 94° 44′, 90° 0′, and 55° 36′; the first and third have been observed by Mr LÉVY, the other three by Mr PHILLIPS.

Cleavage parallel to both diagonals of the prism resulting from the enlargement of the faces *M*, one of them more perfect.

Lustre nearly adamantine. Colour several shades of yellow, often inclining to brown. Streak white, sometimes greyish. Transparent ... translucent.

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Scratches fluor pretty readily, but yields to the knife.

According to the experiments of Mr CHILDREN, it consists chiefly of alumina, lime, magnesia, and a little iron, but very little silica, and no titanium. It was formerly confounded with prismatic Titanium-ore, but is said to have afterwards been distinguished from it under the name of *Pictite*. Its locality is Mount Sorel in Dauphiny, where it is accompanied by rhombohedral Quartz, prismatic Feldspar, Albite, Crichtonite, and pyramidal Titanium-ore.

VAUQUELINITE.

MALACHITE ?

Vauquelinit. LEONH. S. 248. Vauquelinite. Chromate of Lead and Copper. PHILL. p. 350.

Hemi-prismatic. Minute crystals, nearly resembling Fig. 59., with the obtuse edges oa replaced, compressed between *P* and *P*, and joined in regular compositions, parallel to a plane, which passes through the crystals in the direction of ee, and intersects the acute lateral edges. Inclination of *P* on *P'*, from the other individual, nearly = 134° 30′; of the edge oa, or its replacement, on *P*, about 149°.

Fracture uneven. Surface, *P* smooth and even, the rest of the faces a little curved.

Lustre adamantine, often faint. Colour blackish-green, olive-green. Streak siskin-green, often inclining to brown. Faintly translucent, with a fine olive-green tint, opake.

Rather brittle. Hardness = 2·5 ... 3·0. Sp. Gr. = 5·5 ... 5·78, LEONHARD.

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Compound Varieties. Botryoidal, reniform, massive: composition generally impalpable, surface drusy or rough, fracture imperfect and flat conchoidal, lustre faint resinous.

Alone before the blowpipe it intumesces a little, and then froths and melts into a greyish globule, giving at the same time some globules of lead. In the oxidating flame a small quantity effervesces with, and imparts a green colour to borax and salt of phosphorus, which remains transparent on cooling; but in the reducing flame the globule turns red and transparent, or red and opake, or finally black, according to the quantity of the mineral employed. According to BERZELIUS, it consists of

Oxide of Lead	60·87.
Oxide of Copper	10·80.
Chromic Acid	28·33.

It occurs at Beresof in Siberia, along with hemi-prismatic and rhombohedral Lead-baryte, and has been quoted also from Brazil, where it likewise accompanies the hemi-prismatic Lead-baryte.

VELVET-BLUE COPPER.

MALACHITE ?

Velvet-Blue Copper. JAM. Syst. Vol. II. p. 320. Man. p. 332.

Short capillary crystals, in velvety druses and coatings.

Lustre pearly. Colour bright smalt-blue. Translucent.

It has been found lining drusy cavities in prismatic Iron-ore, only at Moldawa in the Bannat of Temeswar, accompanied by several ores of copper. This rare substance is very imperfectly known, and also its chemical composition has not been ascertained.

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WAGNERITE.

Wagnerit. Fuchs. Schweiggers Journal. Vol. III. p. 269.

Hemi-prismatic. Horizontal projection of a crystal represented Fig. 197*; *a* is not a right angle, *b*, *k*, and *g*, if enlarged, would produce parallel edges of combination.

Lustre vitreous. Colour several shades of yellow, sometimes nearly orange-yellow, often inclining to grey. Streak white. Translucent.

Hardness = 5·0 ... 5·5. Sp. Gr. = 3·11, Fuchs.

It has been analysed by Fuchs, who found it to consist of

Phosphoric Acid	41·73.
Fluoric Acid	6·50.
Magnesia	46·66.
Oxide of Iron	5·00.
Oxide of Manganese	0·50.

The only locality of Wagnerite known at present, is the valley called Höllgraben near Werfen in Salzburg, where it occurs in short and irregular veins of rhombohedral Quartz in clay-slate.

WAVELLITE.

HALOIDE.

Wavellite. Jam. Syst. Vol. I. p. 389. Man. p. 333. Wavellite. Subphosphate of Alumine. Phill. p. 146.

Prismatic. $\bar{P}r = 107° 26'$. $P + \infty = 122° 15'$, Phill. Cleavage, $P + \infty$ and $\bar{P}r + \infty$, perfect.

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* I have been indebted for this drawing to Dr Gustavus Rose, who first ascertained the crystal to which it refers, in the possession of Mr Heuland, to be Wagnerite. H.

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Implanted globules: composition thin columnar. Surface drusy.

Lustre of the faces of cleavage intermediate between pearly and vitreous. Colour white, passing into several shades of green, grey, brown, and black. Translucent.

Hardness = 3·5 ... 4·0. Sp. Gr. = 2·337, of the variety from Barnstaple.

Before the blowpipe it loses its lustre and transparency, but does not melt. With boracic acid and iron wire, it yields a globule of phosphuret of iron. It consists, according to FUCHS and BERZELIUS, of

Alumina	37·20	35·35.
Phosphoric Acid	35·12	33·40.
Fluoric Acid	0·00	2·06.
Lime	0·00	0·50.
Oxide of Iron and Manganese	0·00	1·25.
Water	28·00	26·80.

It occurs at Barnstaple in Devonshire, in small veins in clay-slate; at St Austle in Cornwall, in veins traversing granite, accompanied by octahedral Fluor-haloide, pyramidal Tin-ore, pyramidal Copper-pyrites, &c.; in the Shiant isles in Scotland; at Zbirow near Beraun in Bohemia, in a kind of sandstone; at Amberg in the Upper Palatinate, with prismatic Iron-ore, &c.; in fine varieties near Cork in Ireland, and in Brazil.

WITHAMITE.

AUGITE-SPAR.

Withamite. BREWSTER. Edin. Journ. of Science. Vol. II. p. 218.

Hemi-prismatic. Minute crystals observed similar to Fig. 75, lengthened between *M* and *T*, aggre-

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gated in globular masses, radiating from their centres. Inclination of r on $T'' = 128° 20'$, of M on $T = 116° 40'$, nearly, BREWSTER.

Lustre vitreous. Colour carmine-red and pale straw-yellow, in two different directions, perpendicular to each other, and to the lengthened prisms. Streak white. Translucent.

Brittle. Hardness = 6·0 ... 6·5. Sp. Gr. = 3·137, TURNER.

Before the blowpipe it intumesces, but fuses only with difficulty into a dark greenish-grey scoria. Salt of phosphorus dissolves it with effervescence into a globule, which contains a skeleton of silica, and becomes opake on cooling It shews nearly the same reactions as the Epidote from Arendal, with which it likewise agrees in most of its other properties. This mineral is named in compliment to Mr WITHAM, who discovered it in Glencoe in Scotland, in a reddish trap-rock.

YELLOW TELLURIUM.

Yellow Gold-Glance, or Yellow Tellurium. JAM. Syst. Vol. III. p. 379. Yellow Tellurium. PHILL. p. 328.

Prismatic. Combination similar to Fig. 14., having the edges between p and p, between P and P, and between M and M replaced. Inclination of the edge y on the edge y = 74° 30′; of p on p (adj.) = 73° 40′, of M on M = 143°, of p on M = 123° 30′, BROOKE.

Imbedded crystalline laminæ. Traces of cleavage. Fracture uneven.

Lustre metallic. Colour silver-white, much inclining to brass-yellow. Opake.

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Rather brittle. Soft, BREITHAUPT. Sp. Gr. = 10·678, MÜLLER VON REICHENSTEIN.

Before the blowpipe it melts into a metallic globule, and emits a pungent odour. It is soluble in nitric acid, and consists, according to KLAPROTH, of

Tellurium	44·75.
Gold	26·75.
Lead	19·50.
Silver	8·50.
Sulphur	0·50.

As yet it is only known from Nagyag in Transylvania, where it occurs with prismatic Tellurium-glance, hexahedral Glance-blende, macrotypous Parachrose-baryte, &c. in veins traversing porphyry.

YTTRO-CERITE.

Yttro-cerite. JAM. Syst. Vol. III. p. 566. Man. p. 334.
Yttrocerite. PHILL. p. 265.

Massive. Composition granular, strongly coherent, impalpable. Fracture uneven.

Colour violet-blue, inclining to grey and white; sometimes white on the surface. Opake.

Scratches octahedral Fluor-haloide, and is scratched by rhombohedral Quartz, BERZELIUS. Sp. Gr. = 3·447, BERZELIUS.

Before the blowpipe it loses its colour, and becomes white before it glows, but is infusible by itself. With sulphate of lime it melts into a globule, which becomes white on cooling. According to BERZELIUS, it consists of

Lime	47·63	50·00.
Fluoric Acid	25·05	25·45.
Yttria	9·11	8·10.
Oxide of Cerium	18·22	16·45.

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It occurs at Finbo and Broddbo, near Fahlun in Sweden, along with Albite and rhombohedral Emerald, and is imbedded in rhombohedral Quartz.

YTTRO-TANTALITE.

ORE.

Yttro-Tantalite. JAM. Syst. Vol. III. p. 177. Yttro-columbite. PHILL. p. 271.

i. *Black Yttro-tantalite.*

Indistinct traces of crystallisation. Fracture lamellar in one direction, coarse granular in another. Disseminated, seldom of the size of a hazelnut.

Imperfect metallic lustre. Opake. Colour black. Streak grey.

Brittle. Scratches glass. Sp. Gr. = 5·395, BERZELIUS.

ii. *Yellow Yttro-tantalite.*

No trace of crystallisation. It is found between felspar in the state of lamellæ, seldom in grains not exceeding the size of a pepper corn. The longitudinal fracture of the lamellæ is foliated, the cross fracture fine grained.

Lustre resinous on the surface, vitreous in the fracture. Colour yellowish-brown, accidentally with green spots or stripes. Streak white ... opake.

Scratches glass with difficulty, but is very distinctly scratched by it. Sp. Gr. = 5·882, ECKEBERG.

iii. *Dark Yttro-tantalite.*

No trace of crystallisation. Occurs with the preceding, commonly in thin laminæ, seldom in

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grains. Fracture conchoidal in one direction, fine grained in another.

Lustre intermediate between vitreous and resinous.

Colour black, inclining but little to brown.

Streak white. Very small fragments are translucent, almost colourless, sometimes a little yellowish.

Hardness equal to that of the yellow variety.

From the analysis of these different kinds, BERZELIUS obtained the following results:

	Black.	*Yellow.*	*Dark.*
Oxide of Tantalum	57·00	59·50—60·124	51·815.
Yttria	20·25	24·90—29·780	38·515.
Lime	6·25	3·29— 0·500	3·269.
Oxide of Uranium	0·50	8·23— 6·622	1·111.
Tungstic Acid with Tin	8·25 pure	1·25— 1·044	2·592.
Oxide of Iron	3·50	2·72— 1·155	0·555.

These three kinds have been discovered and described by BERZELIUS in the *Afhandlingar i Fysik*, &c., Vol. IV. p. 268. By themselves they are all infusible before the blowpipe; but they decrepitate and acquire a lighter colour. The black Yttro-tantalite froths and melts with soda, but not the others. Borax dissolves them and forms a yellowish glass, which easily loses its transparency. They are not acted upon by acids.

The different kinds of Yttro-tantalite occur at Ytterby, and in the neighbourhood of Fahlun in Sweden.

ZEAGONITE.

GEM.

Abrazite. Zeagonite. Gismondine. PHILL. p. 11. Gismondin. LEONH. S. 645.

Pyramidal. P = 122° 54′, 85° 2′. Vol. I. Fig. 8.

BROOKE. Combination observed, P. P + ∞.

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Cleavage imperfect parallel to P + ∞. Surface, P frequently rounded, P + ∞ smooth, and though generally very small, yet possessing high degrees of lustre. Fracture conchoidal.

Lustre adamantine. Colour pale smalt-blue, milk-white, pearl-grey, and rose-red. Translucent, in small crystals nearly transparent.

Hardness = 7·0 ... 7·5.

According to CARPI, it consists of

Silica	41·4.
Lime	48·6.
Alumina	2·5.
Magnesia	1·5.
Oxide of Iron	2·5.

It phosphoresces before the blowpipe, and becomes friable, but is infusible. It gelatinises with acids, without effervescence. It occurs along with white octahedrons of octahedral Fluor-haloide, with prismatic Feld-spar and other species in the drusy cavities of a volcanic rock at Capo di Bove near Rome. In all its characters, *Z*eagonite is most nearly allied to pyramidal *Z*ircon, as a variety of which it has often been considered, the difference of the angles given by Mr BROOKE being only 0° 25′ on the terminal edges, and 0° 42′ on the lateral edges of the fundamental pyramid. Also the refraction is very considerable, and approaches near that of the same species. Pyramidal *Z*ircon will therefore make an interesting point of comparison with the *Z*eagonite, in future examinations of this mineral. It is evident that the mineral, of which Mr PHILLIPS has given the angle at the base of the four-sided pyramid = 96° 30′, and which is said to yield to the nail, must be another species than that described above, the angles of which have been ascertained by Mr BROOKE. The name of *Abrazite* is sometimes applied to a mineral, which seems to be a variety of paratomous Kouphone-spar (Vol. ii. p. 229.).

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ZURLITE.

Zurlite. PHILL. p. 212. Zurlit. LEONH. p. 663.

Form, rectangular four-sided prisms, lengthened in the direction of the axis, and having sometimes their lateral edges replaced.

Cleavage indistinct. Fracture conchoidal. Surface rough, generally covered with a white coating, sometimes convex.

Lustre resinous. Colour asparagus-green. Streak said to be pearl-grey.

Hardness about 6·0. Sp. Gr. = 3·274.

It is infusible before the blowpipe, but yields with borax a black glass. Nitric acid dissolves it, partly with effervescence, and assumes a yellow colour.

Zurlite has been discovered and described as above, by REMONDINI, in the Memoirs of the Academy of Naples.

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APPENDIX II.

MINERALS, WHICH WILL PROBABLY NEVER FORM DISTINCT SPECIES IN THE MINERAL SYSTEM.

ADHESIVE SLATE.

Adhesive Slate. JAM. Syst. Vol. II. p. 68. Man. p. 476.
Adhesive Slate. PHILL. p. 50.

Massive: composition impalpable. Principal fracture slaty, more and less perfect. Cross fracture even, flat conchoidal.

Colour yellowish-grey, passing into white and smoke-grey. A little shining in the streak. Feebly translucent on the edges.

Sectile. Adheres strongly to the tongue, feels a little greasy, and is very soft. Sp. Gr. = 2·086, KLAPROTH.

It absorbs water with great avidity, but does not fall to pieces. On being exposed to a red heat, it becomes brownish-red, and loses in weight. It consists, according to KLAPROTH and LAMPADIUS, of

Silica	66·50	30·80.
Alumina	7·00	0·00.
Magnesia	1·50	28·00.
Lime	1·25	0·80.
Oxide of Iron	2·50	11·20.

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Carbonic Acid	0·00	27·00.
Water	19·00	0·30.

It occurs at Menil Montant, and Montmartre near Paris.

ALUM-SLATE.

Alum-Slate. JAM. Syst. Vol. II. p. 276. Man. p. 443.
Alum-Slate. PHILL. p. 48.

Massive. Spheroidal shapes. Composition impalpable. Principal fracture imperfectly slaty; cross fracture earthy.

Nearly dull. Colour intermediate between greyish- and blueish-black. Streak black, acquires some lustre. Opake.

Not very brittle. Intermediate between semi-hard and soft. Sp. Gr. = 2·339 ... 2·588, KIRWAN.

Alum-slate has been divided into two kinds, *common* and *glossy* alum-slate. The latter differs from the former only by fissures having a higher degree of a somewhat metallic lustre, which traverse it in a direction nearly parallel to that of the slaty structure. Alum-slate seems to be closely connected with clay-slate.

Exposed to the fire, it burns and becomes blueish-grey. It occurs in particular beds between clay-slate and grey-wacke-slate, near Reichenbach in Saxony, also at Reussisch-Ebersdorf, in the valley of the Saale, in several places in the forest of Thuringia, in the Palatinate, in Bohemia, &c.; and is used in manufacturing alum and sulphate of iron. The mineral called *Alum-earth* is in a closer relation to Slate-clay (Vol. III. p. 181.) and to Earthy Coal (Vol. III. p. 62.).

BITUMINOUS SHALE.

Bituminous Shale. JAM. Syst. Vol. II. p. 63. Bituminous Marle. PHILL. p. 159.

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Massive: composition impalpable. Fracture rather thin and straight, slaty.

Faintly glimmering. Colour brownish-black and blackish-brown. Streak shining, with a resinous lustre. Opake.

Rather sectile, feels very little greasy. Intermediate between soft and very soft. Sp. Gr. = 1·995, KIRWAN.

According to WERNER, it is slate-clay with a small portion of bitumen. It occurs at Wehrau in Lusatia, also in the neighbourhood of Elbogen in Bohemia, in the Tyrol, in great quantities in Thuringia, and in many other countries, with different varieties of clay, and with coal.

BOLE.

Bole. JAM. Syst. Vol. II. p. 86. Man. p. 314. Bole. PHILL. p. 53.

Massive: composition impalpable. Fracture perfectly conchoidal, sometimes rather flat.

Faintly glimmering ... dull. Colour brown, yellow, and red. Streak shining, resinous. Feebly translucent on the edges ... opake.

Rather sectile. Adheres to the tongue, feels greasy, and is very soft, sometimes approaching to soft. Sp. Gr. = 1·600, KLAPROTH; = 1 977, BREITHAUPT.

If thrown into water, it emits a crackling noise and falls into powder. It occurs in irregular beds or disseminated masses in wacke, trapp-tuff, &c., and is found at Striegau in Silesia, at Scheibenberg in Saxony, the Habichtswald in Hessia, in Thuringia, Tuscany, &c.

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CLAYSTONE.

Claystone. JAM. Syst. Vol. II. p. 66.

Massive. Composition impalpable. Fracture uneven, flat conchoidal, sometimes inclining to slaty.

Colour, different shades of grey and red, none of them bright. Opake.

Not particularly brittle. Does not adhere to the tongue; feels meagre. Sometimes semi-hard, sometimes soft, or even very soft. Sp. Gr. = 2·210, KARSTEN.

Claystone appears to be the residue of the crystalline formation of several kinds of rock, particularly of porphyry; hence its characters are so very different in different specimens, and it seems to exhibit so many passages to other minerals, of which in reality not one is existing. It forms the base of several varieties of porphyry, such as are called clay- or claystone-porphyry, and occurs in various parts of Saxony, as at Chemnitz, Grumbach, also in veins at Frauenstein, Marienberg, Klingenberg, &c.

COMMON CLAY.

Common Clay. JAM. Syst. Vol. II. p. 57. Pipe-clay. Potter's Clay. Loam. PHILL. p. 55. 56.

Massive. Composition impalpable. Fracture uneven, fine earthy in the small; more or less perfectly slaty.

Dull. Colour white, grey, brown, red, yellow, &c., sometimes in striped, veined, or spotted delineations. Streak more or less shining.

Sectile. Adheres more or less strongly to the

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tongue. Feels more or less greasy. Soft, sometimes approaching to friable. Not particularly heavy, passing into light. Sp. Gr. of earthy Potter's Clay = 1·800 ... 2·000, KIRWAN; = 2·085, KARSTEN; Slate-clay = 2·600 ... 2·680, KIRWAN; = 2·636, KARSTEN.

Common Clay has been divided into *Loam*, *Potter's Clay*, *Variegated Clay*, and *Slate-Clay*; and Potter's clay again into *earthy* and *slaty*; which division rests either upon particular, though accidental properties, or upon the employment made of the varieties.

Clay is a mixture of decomposed minerals, and hence it is little constant in its composition. Several varieties soften in water, and allow themselves to be kneaded and formed into moulds, a property to which they owe their well known employment. Some are easily fusible, others refractory; some acquire particular tints of colour, others lose theirs, and become white when exposed to a strong heat; upon all of which properties their applicability depends. They occur in beds near the surface of the earth, or covered by the soil in the formations of brown and black coal. In the latter they very often contain remains of vegetables, and are called slate-clay, which is intimately related to bituminous shale and alum-earth.

The appropriate varieties of clay are of various important applications in pottery, in manufacturing stone-ware and porcelain, in constructing furnaces for metallurgic operations, &c.

DRAWING SLATE OR BLACK CHALK.

Drawing-Slate or Black Chalk. JAM. Syst. Vol. II. p. 273. Man. p. 443. Black Chalk. PHILL. p. 55.

Massive. Composition impalpable. Principal frac-

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ture rather imperfectly slaty, cross fracture fine earthy.

Faint glimmering in the principal fracture, dull in the cross fracture. Colour intermediate between greyish- and blueish-black. Retains the colour in the streak, and acquires a higher degree of lustre. Opake.

Sectile. Soils more or less, and writes. Adheres a little to the tongue, feels fine and rather meagre, and is very soft. Sp. Gr. = 2·114, KIRWAN; = 2·186, BRISSON.

Exposed to fire it loses its black colour, and becomes reddish or reddish-grey. Before the blowpipe it yields a white glass, according to LINK. The variety from Bayreuth has been found by WIEGLEB to consist of

Silica	64·50.
Alumina	11·25.
Oxide of Iron	2·75.
Carbon	11·00.
Water	7·50.

It occurs in rocks of clay-slate, and seems to be very nearly allied to clay-slate and alum-slate. The finest and most applicable varieties come from Italy, Spain, and France. It is also found in Bayreuth, in Thuringia, &c. It is used as a drawing material.

FULLER'S EARTH.

Fuller's Earth. JAM. Syst. Vol. II. p. 300. MAN. p. 442.
Fuller's Earth. PHILL. p. 52.

Massive. Composition impalpable. Fracture uneven, splintery, earthy: in the great sometimes imperfectly and flat conchoidal, or even slaty.

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Dull. Colour green, grey, white. Streak shining, resinous. Feebly translucent on the edges ... opake.

Perfectly sectile. Feels very greasy. Adheres but feebly or not at all to the tongue, and is very soft. Sp. Gr. = 1·819, HOFFMANN; = 2·198, BREITHAUPT.

If thrown into water, it falls to pieces, and forms a paste which is not plastic. It absorbs oil and fat. It is formed by the decomposition of certain rocks, as for instance at Rosswein in Saxony, at Feistritz on the Bacher in Stiria; and probably also at Reifenstein and Rein in the same country, although in these two places the mode of its formation is not so easily observed. It occurs also in Moravia, in great quantities and very pure at Nutfield in Surry, and other places in England, &c., and is used for cleansing woollen cloth.

LITHOMARGE.

Lithomarge. JAM. Syst. Vol. II. p. 74. Man. p. 311.
Lithomarge. PHILL. p. 52.

Massive. Spheroidal. Composition impalpable. Fracture uneven, large and flat conchoidal in the large, fine earthy in the small. Sometimes the particles do not cohere, and are found in the shape of a fine scaly powder.

Colour white, pearl-grey, lavender-blue, flesh-red, ochre-yellow. Somewhat shining in the streak. Opake.

Sectile. Adheres strongly to the tongue, feels fine and greasy, and is soft, sometimes friable. Sp. Gr. = 2·435 ... 2·492, BREITHAUPT.

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It has been divided into two kinds, the *friable*, and the *solid* or *indurated Lithomarge*.

It does not fall to pieces when thrown into water; and hardens if exposed to a strong heat. It occurs in various parts of Saxony, as in tin-veins at Bobershau and Altenberg; in porphyry at Rochlitz; in the coal measures at Planitz near Zwickau, where the variety called *Terra miraculosa Saxoniæ* is found; in the drusy cavities of the Topaz-rock at Auerbach; in serpentine at Zöblitz; in trap in the county of Antrim in Ireland, &c.

MOUNTAIN SOAP.

Mountain Soap. JAM. Syst. Vol. II. p. 74. Man. p. 312. Bole. PHILL. p. 53.

Massive. Composition impalpable. Fracture fine earthy.

Dull. Colour light brownish-black. Streak shining, resinous. Opake.

Perfectly sectile. Does not soil, but writes, adheres strongly to the tongue, feels very greasy, is very soft, and light, approaching to not particularly heavy.

It has been found at Olkucz in Poland, and is a very rare mineral.

POLISHING SLATE.

Polier or Polishing Slate. JAM. Vol. II. p. 70. Man. p. 425. Polishing-slate. PHILL. p. 51.

Massive. Composition impalpable. Principal fracture slaty, thin and straight, cross fracture fine earthy.

Colour yellowish-grey, inclining to white or brown.

Feels fine, but meagre, adheres but little or not at

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all to the tongue, is very soft, passing into friable. Sp. Gr. = 0·590 ... 0·606, HABERLE.

It imbibes water, but does not fall to pieces. It becomes red when burnt, but is infusible. It consists, according to BUCHOLZ, of

Silica	79·00.
Alumina	1·00.
Lime	1·00.
Oxide of Iron	4·00.
Water	14·00.

It is believed to have been formed from the ashes of burnt coal. It occurs at Planitz near Zwickau, and at Kutschlin near Bilin in Bohemia.

TRIPOLI.

Tripoli. JAM. Syst. Vol. II. p. 71. Man. p. 470. Tripoli. PHILL. p. 53.

Massive. Composition impalpable. Fracture earthy in the small, sometimes slaty in the great.

Colour grey, more particularly yellowish- and ash-grey, passing into white and yellow. Opake.

Not particularly brittle. Does not adhere to the tongue, feels meagre and a little rough, is said to be soft passing into very soft (it is nevertheless applied as a powerful material for polishing). Sp. Gr. = 1·857, DELAMÉTHERIE; = 2·202, BUCHOLZ.

It imbibes water, which softens it. When burnt it becomes white, and is hardened; but it is very difficultly fusible. It consists, according to BUCHOLZ and HAASE, of

Silica	81·00	90·00.
Alumina	1·50	7·00.

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Oxide of Iron	8·00	3·00.
Sulphuric Acid	3·50	0·00.
Water	5·00	0·00.,

with a trace of Lime. It seems to be nothing but a very fine arenaceous variety of quartz, accidentally mixed with a little clay.

UMBER.

Umber. JAM. Syst. Vol. III. p. 241. Umber. PHILL. p. 232.

Massive. Composition impalpable. Fracture large and flat conchoidal in the great, very fine earthy in the small.

Dull. Colour liver-, chestnut-, dark yellowish-brown. Acquires some lustre in the streak. Opake.

Imperfectly sectile. Does not soil, but writes, adheres strongly to the tongue, feels a little rough and meagre, and is very soft. Sp. Gr. = 2·206, BREITHAUPT.

It imbibes water with great avidity, and emits air bubbles, but does not become soft. It occurs in beds with brown jasper in the isle of Cyprus, and is used by painters as a brown colour. Its chemical composition is said to be oxide of iron 48, oxide of manganese 20, silex 13, alumina 5, water 14.

WHET-SLATE.

Whet-Slate. JAM. Syst. Vol. II. p. 271. Whet-Slate or Hone. Man. p. 343. Whetslate. Turkey Hone. PHILL. p. 48.

Massive. Composition impalpable. Fracture

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straight slaty in the great, fine splintery in the small.

Faintly glimmering, almost dull. Colour greenish-grey, mountain-, asparagus-, oil-green. Streak greyish-white. Translucent on the edges.

Not particularly brittle. Said to be soft in a low degree. (It is sometimes as hard as rhombohedral quartz). Sp. Gr. = 2·722, KIRWAN.

Whet-slate is a slaty rock, containing a great proportion of quartz, in which the component particles (the same as in clay-slate, mica-slate, and gneiss, but in different relative quantities) are so very small, as to withdraw themselves from observation. This may serve for explaining on one hand the passage of whet-slate into clay-slate, on the other hand the employment it allows for grinding, which is impossible in any mineral that in reality is *soft*. Whet-slate occurs in beds between clay-slate, particularly in the older rocks; and the varieties best adapted for use are found at Sonnenberg in Meinungen, and at Probstzelle and Lichtetanne in Saalfeld. They are likewise brought from the Levant. Less useful or fine grained varieties are found in many countries. The varieties from the neighbourhood of Liege, *Argile schisteuse novaculaire* of HAÜY, are not comprehended among the whet-slate of WERNER. They consist of two layers of stone of different colour and composition, one of them being yellowish-grey and very fine grained, the other reddish-brown and coarser. The use of whet-slate as a grinding material is sufficiently known.

YELLOW EARTH.

Yellow Earth. JAM. Syst. Vol. II. p. 81. Man. p. 312.

Massive. Composition impalpable. Principal frac-

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ture more and less imperfectly and thick slaty, sometimes fine earthy. Cross fracture fine earthy. Faintly glimmering, dull. Colour ochre-yellow. Acquires some lustre in the streak. Opake. Sectile. Adheres rather strongly to the tongue. Soils a little and writes. Is very soft, partly also friable. Sp. Gr. = 2·240, BREITHAUPT.

If thrown into water it falls into powder and emits a noise. If burnt it becomes red. It is a mixture of fine sand, oxide of iron, clay, &c., and occurs at Wehrau in Upper Lusatia, in France, &c. It is employed both in its natural state and burnt, in painting houses, &c., as a coarse colouring material.

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PLATES

AND

EXPLANATIONS.

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VOL. I. PLATE I.

FIG. 1. H. The hexahedron, with a pyramidal section, and a pyramidal axis.

FIG. 2. O. The octahedron.

FIG. 3. H. O. Combination of the hexahedron and the octahedron.

FIG. 4. The same, the faces of the octahedron larger.

FIG. 5. The hexahedron, with two rhombohedral sections, and a rhombohedral axis.

FIG. 6. The hexahedron, with two prismatic sections, and a prismatic axis.

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VOL. I. PLATE II.

FIG. 7. R. A rhombohedron.

FIG. 8. P. An isosceles four-sided pyramid.

FIG. 9. P. A scalene four-sided pyramid.

FIG. 10. P. An isosceles six-sided pyramid.

FIG. 11. $(P)^n$. A scalene six-sided pyramid.

FIG. 12. $(P)^n$. A scalene eight-sided pyramid.

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VOL. I. PLATE III.

FIG. 13. $\frac{O}{2}$. *o* The tetrahedron.

FIG. 14. — $\frac{O}{2}$. *o'* The same, in inverse position.

FIG. 15. $\frac{Cn}{2}$. *c* A trigonal-dodecahedron.

FIG. 16. — $\frac{Cn}{2}$. *c'* The same, in inverse position.

FIG. 17. $\frac{Bn}{2}$. *b* A digrammic tetragonal-dodecahedron.

FIG. 18. — $\frac{Bn}{2}$. *b'* The same, in inverse position.

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VOL. I. PLATE IV.

FIG. 19. $\frac{A_n}{2}$. a — A hexahedral pentagonal-dodecahedron.

FIG. 20. $-\frac{A_n}{2}$. a' — The same, in inverse position.

FIG. 21. $r\frac{T_n}{4}$. t — A right tetrahedral pentagonal-dodecahedron.

FIG. 22. $-r\frac{T_n}{4}$. t' — The same, in inverse position.

FIG. 23. $l\frac{T_n}{4}$. t'' — A left tetrahedral pentagonal-dodecahedron.

FIG. 24. $-l\frac{T_n}{4}$. t''' — The same, in inverse position.

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VOL. I. PLATE V.

FIG. 25. $\frac{T_n}{2\,i}$. t, t' — A tetrahedral trigonal-icositetrahedron.

FIG. 26. $-\frac{T_n}{2\,i}$. t', t''' — The same, in inverse position.

FIG. 27. $\frac{T_n}{2\,ii}$. t', t'' — A trigrammic tetragonal-icositetrahedron.

FIG. 28. $-\frac{T_n}{2\,ii}$. t, t''' — The same, in inverse position.

FIG. 29. $r\,\frac{T_n}{2\,iii}$. t'', t''' — A right pentagonal-icositetrahedron.

FIG. 30. $l\,\frac{T_n}{2\,iii}$. t, t' — A left pentagonal-icositetrahedron.

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VOL. I. PLATE VI.

FIG. 31. D. *d* The dodecahedron.

FIG. 32. An. *a* A hexahedral trigonal-icositetrahedron.

FIG. 33. Bn. *b* An octahedral trigonal-icositetrahedron.

FIG. 34. Cn. *c* A digrammic tetragonal-icositetrahedron.

FIG. 35. Tn. *t* A tetraconta-octahedron.

FIG. 36. Derivation of the tessular forms from the hexahedron.

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VOL. I. PLATE VII.

FIG. 37. Derivation of the principal series of scalene four-sided pyramids.

FIG. 38. Derivation of the subordinate series of scalene four-sided pyramids.

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VOL. I. PLATE VIII.

FIG. 39. Derivation of scalene four-sided pyramids, having a dissimilar transverse section, from the auxiliary form.

FIG. 40. Derivation of scalene four-sided pyramids, having a dissimilar transverse section, from the fundamental form.

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VOL. I. PLATE IX.

FIG. 41. **P.** Fundamental pyramid of the hemiprismatic system.

FIG. 42. P. Fundamental pyramid of the tetartoprismatic system.

FIG. 43. Derivation of two subsequent rhombohedrons from each other.

FIG. 44. Transverse sections of four consecutive rhombohedrons, having the same horizontal projection.

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VOL. I. PLATE X.

FIG. 45. Derivation of isosceles four-sided pyramids.

FIG. 46. Derivation of the rhombohedron with an infinite axis (a regular six-sided prism).

FIG. 47. Derivation of scalene six-sided pyramids.

FIG. 48. Derivation of isosceles six-sided pyramids.

FIG. 49. Combination of two rhombohedral forms, producing EF and E′F, the *Lines of Combination.*

FIG. 50. Similar combination of three rhombohedral forms.

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VOL. I. PLATE XI.

FIG. 51. $2\,(P)^{m}$. a, a', b, b' A di-pyramid.

FIG. 52. $\pm \frac{R}{2}\left\{\begin{matrix} a' \\ a \end{matrix}\right\}$. A three-sided pyramid, formed by alternating pairs of faces of a di-rhombohedron.

FIG. 53. $\frac{r}{r}\frac{(P)^{m}}{2}\left\{\begin{matrix} a \\ a \end{matrix}\right\}$. A right three-sided trapezohedron, containing on both ends faces of the same pyramid.

FIG. 54. $\frac{l}{l}\frac{(P)^{m}}{2}\left\{\begin{matrix} b \\ b \end{matrix}\right\}$. A left three-sided trapezohedron of the same kind.

FIG. 55. $\frac{+\ r}{-\ r}\frac{(P)^{m}}{2}\left\{\begin{matrix} a \\ a' \end{matrix}\right\}$. A right three-sided trapezohedron, the pyramid from which the lower faces are derived being in inverse position from that to which the upper ones belong.

FIG. 56. $\frac{+\ l}{-\ l}\frac{(P)^{m}}{2}\left\{\begin{matrix} b \\ b' \end{matrix}\right\}$. A left three-sided trapezohedron of the same kind.

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VOL. I. PLATE XII.

FIG. 57. $\frac{r}{r}\,\frac{2\,((P)^m)}{2}\,\left\{\begin{matrix}a\\a'\end{matrix}\right\}$. A right six-sided trapezohedron.

FIG. 58. $\frac{l}{l}\,\frac{2\,((P)^m)}{2}\,\left\{\begin{matrix}b\\b'\end{matrix}\right\}$. A left six-sided trapezohedron.

FIG. 59. Rhombohedral combination.

$$\underset{a}{R-1}.\ \underset{b}{(P-2)^3}.\ \underset{c}{R}.\ \underset{d}{\tfrac{5}{4}R}.\ \underset{e}{R+1}.\ \underset{f}{(P)^3}.\ \underset{g}{R+\infty}.$$

FIG. 60. Di-rhombohedral combination.

$$\underset{a}{R-\infty}.\ \underset{b}{P}.\ \underset{c}{2\,(R)}.\ \underset{d}{P+1}.\ \underset{e}{P+\infty}.$$

FIG. 61. $\frac{P}{2}$. A hemi-pyramidal form, analogous to the tetrahedron.

FIG. 62. $-\frac{P}{2}$. The same, in inverse position.

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VOL. I. PLATE XIII.

FIG. 63. $\frac{r}{r}\frac{(P)^m}{2}$. A right four-sided trapezohedron.

FIG. 64. $\frac{l}{l}\frac{(P)^m}{2}$. A left four-sided trapezohedron.

FIG. 65. $\frac{(P)^m}{2}$. A hemi-pyramidal form, analogous to the tetrahedron, obtained from a scalene eight-sided pyramid.

FIG. 66. $-\frac{(P)^m}{2}$. The same, in inverse position.

FIG. 67. Pyramidal combination.

P. P + 1. $(P)^3$. P + ∞. [P + ∞].
a *b* *c* *d* *e*

FIG. 68. Pyramidal combination.

P. $(P)^3$. $\frac{3}{2}P + 3$. P + ∞. [P + ∞].
a *c* *f* *d* *e*

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FIG. 69. and 70. Developements of pyramidal combinations.

FIG. 71. Developement of a prismatic combination.

FIG. 72. Prismatic combination.

$\breve{P}r - 1$. $P - 1$. $\breve{P}r$. $(\breve{P}r - 1)^3$.
a *b* *c* *d*

P. $P + \infty$. $(\breve{P}r + \infty)^3$. $\breve{P}r + \infty$.
e *f* *g* *h*

FIG. 73. and 74. Explanation of the horizontal striæ upon the faces of the six-sided prism of rhombohedral Quartz.

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FIG. 75. $\frac{A_2}{2}$. $\frac{T_1}{2}$. Semi-tessular combination
e f
with parallel faces.

FIG. 76. $-\frac{A_2}{2}$. $\frac{T_1}{2}$. Semi-tessular combination
e' f
with parallel faces.

FIG. 77. $\frac{O}{2}$. $\frac{C_1}{2}$. Semi-tessular combination
P l
with inclined faces.

FIG. 78. $\frac{O}{2}$. $-\frac{C_1}{2}$. Semi-tessular combination
P r
with inclined faces.

FIG. 79. The saddle-shaped lens.

FIG. 80. A rhombohedron with curved faces, produced by composition.

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FIG. 1. Axotomous Arsenical-pyrites.

$\breve{P}r.\quad P + \infty.$

o *d*

FIG. 2. Prismatic Arsenical-pyrites.

$\breve{P}r - 1.\quad P + \infty.$

r ***M***

FIG. 3. Prismatic Andalusite.

$P - \infty.\quad \breve{P}r.\quad P + \infty.$

P *l* ***M***

FIG. 4. Di-prismatic Iron-ore.

$\breve{P}r.\quad P.\quad P + \infty.$

P *o* ***M***

FIG. 5. Di-prismatic Olive-malachite.

$\breve{P}r.\quad P.\quad P + \infty.$

o ***P*** *u*

FIG. 6. Prismatic Epsom-salt.

$P.\quad P + \infty.\quad \breve{P}r + \infty.$

l ***M*** *o*

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FIG. 7. Prismatic Melane-glance.

$\breve{P}$. $(\breve{P}r + \infty)^3$. $\bar{P}r + \infty$.

P *d* *s*

FIG. 8. Prismatic Olive-malachite.

$\breve{P}r$. $P + \infty$. $\bar{P}r + \infty$.

l *r* *n*

FIG. 9. Prismatic Nitre-salt.

$\breve{P}r + 1$. $P + \infty$. $\breve{P}r + \infty$

P *M* *h*

FIG. 10. Prismatoidal Kouphone-spar.

$P - \infty$. $\breve{P}$. $\breve{P}r + \infty$. $\bar{P}r + \infty$.

P *r* *T* *M*

FIG. 11. Axotomous Kouphone-spar.

$P - \infty$. $\breve{P}$. $\breve{P}r + \infty$. $\bar{P}r + \infty$.

P *r* *M* *T*

FIG. 12. Prismatoidal Garnet.

$P - \infty$. $\bar{P}r$. $(\bar{P}r + \infty)^3$. $\breve{P}r + \infty$.

P *r* *M* *o*

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FIG. 13. Axotomous Triphane-spar.

$P - \infty$.	$\breve{P}r + n$.	$P + \infty$.	$\breve{P}r + \infty$.
P	*o*	*M*	*l*

FIG. 14. Prismatic Antimony-baryte.

$\breve{P}r - 1$.	P.	$(\breve{P}r + \infty)^3$.	$\breve{P}r + \infty$.
p	*P*	*M*	*h*

FIG. 15. Prismatic Iron-pyrites.

$\breve{P}r$.	P.	$P + \infty$.	$\breve{P}r + \infty$.
g	*h*	*l*	*P*

FIG. 16. Prismatic Natron-salt.

$\breve{P}r$.	P.	$(\breve{P}r + \infty)^3$.	$\breve{P}r + \infty$.
o	*P*	*d*	*p*

FIG. 17. Prismatoidal Sulphur.

$\breve{P}r$.	P.	$(\breve{P}r + \infty)^3$.	$\breve{P}r + \infty$.
o	*P*	*u*	*s*

FIG. 18. Prismatic Sulphur.

$P - \infty$.	$\frac{4}{5}P - 2$.	$\breve{P}r$.	P.	$P + \infty$.
r	*s*	*n*	*P*	*m*

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FIG. 19. Scorodite.

$$P - \infty \quad P \quad \breve{P}r + 1 \quad (\bar{P}r + \infty)^3 \quad \bar{P}r + \infty$$
$$k \qquad P \qquad m \qquad d \qquad r$$

FIG. 20. Prismatic Chrysolite.

$$\bar{P}r \quad (\bar{P}r - 1)^5 \quad P \quad (\bar{P}r + \infty)^3 \quad \bar{P}r + \infty$$
$$d \qquad e \qquad p \qquad n \qquad M$$

FIG. 21. Prismatic Hal-baryte.

$$\breve{P}r \quad \bar{P}r \quad P \quad (\breve{P}r + \infty)^3 \quad \breve{P}r + \infty$$
$$o \qquad M \qquad z \qquad d \qquad P$$

FIG. 22. Paratomous Kouphone-spar.

$$\breve{P}r \quad P \quad \breve{P}r + 2 \quad \bar{P}r + \infty \quad \breve{P}r + \infty$$
$$s \qquad P \qquad t \qquad g \qquad o$$

FIG. 23. Prismatic Nitre-salt.

$$\breve{P}r - 1 \quad \breve{P}r \quad \breve{P}r + 1 \quad P + \infty \quad \breve{P}r + \infty$$
$$x \qquad P \qquad s \qquad M \qquad h$$

FIG. 24. Di-prismatic Copper-glance.

$$P - \infty \quad \bar{P}r - 1 \quad \breve{P}r \quad \breve{P}r + \infty \quad \bar{P}r + \infty$$
$$k \qquad o \qquad d \qquad s \qquad r$$

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FIG. 25. Prismatic Corundum.

$\breve{P}r.\ P.\ (\breve{P}+\infty)^5.\ \breve{P}r+\infty.\ \bar{P}r+\infty.$
$i\quad o\quad s\quad T\quad M$

FIG. 26. Prismatic Gypsum-haloide.

$P-\infty.\ P.\ (\bar{P}r)^3.\ (\bar{P})^5.\ \breve{P}r+\infty.$
$P\quad o\quad n\quad f\quad T$
$\bar{P}r+\infty.$
M

FIG. 27. Prismatoidal Manganese-ore.

$P-\infty.\ \bar{P}r.\ P.\ (\breve{P}r-1)^5.\ P+\infty.$
$o\quad d\quad P\quad y\quad M$
$(\breve{P}r+\infty)^5.$
s

FIG. 28. Peritomous Hal-baryte.

$P-\infty.\ P-1.\ P.\ \breve{P}r+1.\ P+\infty.$
$o\quad z\quad y\quad P\quad M$
$\breve{P}r+\infty.$
h

FIG. 29. Hopeite.

$P-\infty.\ \bar{P}r.\ P.\ (\breve{P}r+\infty)^3.\ \breve{P}r+\infty.$
$g\quad M\quad P\quad s\quad p$
$\bar{P}r+\infty.$
l

FIG. 30. Prismatic Melane-glance.

$\breve{P}r.\ P.\ (\bar{P}r)^3.\ (\breve{P}r+\infty)^3.\ \breve{P}r+\infty.$
$o\quad P\quad a\quad d\quad p$
$\bar{P}r+\infty.$
s

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FIG. 31. Di-prismatic Lead-baryte.

$\breve{P}r.$ $P.$ $\frac{5}{4}\ \breve{P}r + 2.$ $(\breve{P}r + \infty)^5.$
M t e u
$(\bar{P}r + \infty)^5.$ $\breve{P}r + \infty.$
s l

FIG. 32. Prismatoidal Antimony-glance.

$\frac{4}{5}\ P - 2.$ $\breve{P}r - 1.$ $(\frac{4}{5}\ \breve{P}r - 2)^5.$ $P.$
s a e P
$(\frac{4}{5}\ \breve{P}r - 2)^7.$ $P + \infty.$ $\breve{P}r + \infty.$
b m o

FIG. 33. Serpentine.

$\breve{P}r.$ $P.$ $\breve{P}r + 1.$ $(\breve{P}r)^5.$ $(\breve{P}r + \infty)^5.$
o P r n d
$\breve{P}r + \infty.$ $\bar{P}r + \infty.$
b s

FIG. 34. Prismatic Topaz.

$P - \infty.$ $\frac{4}{5}\ P - 1.$ $(\frac{4}{5}\ \breve{P}r - 1)^5.$ $P.$
P s x o
$\breve{P}r + 1.$ $\breve{P}r + 2.$ $P + \infty.$ $(\breve{P}r + \infty)^5.$
n y M l

FIG. 35. Prismatic Antimony-glance.

$P - \infty.$ $\breve{P}r.$ $P.$ $(\bar{P}r)^5.$ $(\breve{P}r)^5.$
k o P z a
$\frac{3}{4}\ P + 2.$ $(\breve{P}r + \infty)^5.$ $\breve{P}r + \infty.$
b d r
$\bar{P}r + \infty.$
s

FIG. 36. Prismatic Topaz.

$(\frac{4}{5}\ \breve{P}r - 1)^5.$ $P.$ $\breve{P}r + 1.$ $P + \infty.$
x o n M
$(\breve{P}r + \infty)^5.$ $\breve{P}r + 1.$ $P.$
l n' $o'.$

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FIG. 37. Prismatic Zinc-baryte.

$$\underset{k}{P-\infty}.\ \underset{l}{\breve{P}r-1}.\ \underset{o}{\breve{P}r}.\ \underset{m}{\tfrac{5}{4}\breve{P}r+1}.\ \underset{p}{\tfrac{5}{4}\breve{P}r+2}.$$

$$\underset{d}{(\breve{P}r+\infty)^5}.\ \underset{s}{\breve{P}r+\infty}.\ \underset{P}{P}.$$

FIG. 38. Di-prismatic Lead-baryte.

$$\underset{M}{\breve{P}r}.\ \underset{t}{P}.\ \underset{u}{(\breve{P}r+\infty)^3}.\ \underset{s}{(\bar{P}r+\infty)^3}.\ \underset{l}{\breve{P}r+\infty},$$

$$2\left\{\breve{P}r\right\}.$$

FIG. 39. Prismatic Lime-haloide.

$$\underset{x}{\bar{P}r-2}.\ \underset{P}{\bar{P}r-1}.\ \underset{r}{P}.\ \underset{M}{(\breve{P}r+\infty)^3}.\ \underset{h}{\bar{P}r+\infty},$$

$$\left\{\frac{(\breve{P}r+\infty)^3}{2}\right\}.$$

FIG. 40. Paratomous Kouphone-spar.

$$\underset{s}{\breve{P}r}.\ \underset{P}{P}.\ \underset{t}{\breve{P}r+2}.\ \underset{g}{\bar{P}r+\infty}.\ \underset{o}{\breve{P}r+\infty},$$

$$2\left\{\frac{P+\infty}{2}\right\}.$$

FIG. 41. Prismatic Copper-glance.

$$\underset{a}{(\bar{P})^3}.\ \underset{e}{(\bar{P}r+\infty)^5}.\ \underset{s}{\bar{P}r+\infty},\ 2\left\{\frac{(\bar{P}r)^3}{4}\right\}.$$

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FIG. 42. Prismatic Iron-pyrites.

$$\breve{P}r.\quad P+\infty.\quad \breve{P}r+\infty,\ \left\{\bar{P}r\right\}\ \left\{\bar{P}r\right\}.$$
$$M \qquad l \qquad P$$

FIG. 43. Prismatic Iron-pyrites.

$$\breve{P}r.\ \bar{P}r.\ P+\infty.\ \breve{P}r+\infty,\left\{\bar{P}r\right\}\left\{\breve{P}r\right\}.$$
$$g\ M \qquad l \qquad P$$

FIG. 44. Diatomous Kouphone-spar.

$$\frac{\breve{P}r}{2}.\quad P+\infty.$$
$$P \qquad M$$

FIG. 45. Hemi-prismatic Natron-salt.

$$\frac{P}{2}.\quad (\breve{P}r+\infty)^3.\quad \bar{P}r+\infty.$$
$$P \qquad M \qquad l$$

FIG. 46. Prismatic Cobalt-mica.

$$\frac{\breve{P}r}{2}.\quad \breve{P}r+\infty.\quad \bar{P}r+\infty.$$
$$M \qquad T \qquad P$$

FIG. 47. Prismatic Titanium-ore.

$$\frac{\bar{P}r}{2}.\ \frac{P}{2}.\ -\frac{\bar{P}r}{2}.\ (\bar{P}r+\infty)^3.$$
$$P \quad r \quad y \quad n$$

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FIG. 48. Hemi-prismatic Sulphur.

$$-\frac{\breve{P}r}{2}. \quad -\frac{P}{2}. \quad P + \infty. \quad (\breve{P}r + \infty)^5.$$

P *n* *M* *l*

FIG. 49. Prismatic Scheelium-ore.

$$\frac{\bar{P}r - 1}{2}. \quad \breve{P}r. \quad -\frac{\bar{P}r - 1}{2}. \quad P + \infty.$$

t *u* *t'* *r*

$\bar{P}r + \infty$.

M

FIG. 50. Hemi-prismatic Kouphone-spar.

FIG. 51. Prismatic Borax-salt.

$$\frac{P}{2} \quad \frac{(\breve{P}r)^5}{2}. \quad -\frac{\breve{P}r}{2}. \quad (\breve{P}r + \infty)^3. \quad \breve{P}r + \infty.$$

o *z* *P* *r* *M*

$\bar{P}r + \infty$.

T

FIG. 52. Hemi-prismatic Vitriol-salt.

$$P - \infty. \quad \frac{\frac{4}{3}P - 2}{2}. \quad \frac{\breve{P}r}{2}. \quad \frac{P}{2}. \quad \bar{P}r. \quad -\frac{\breve{P}r}{2}.$$

b *g* *v* *P* *o* *t*

$P + \infty$. $\bar{P}r + \infty$.

f *u*

FIG. 53. Hemi-prismatic Lead-baryte.

$$\frac{\bar{P}r}{2}. \quad \frac{P}{2}. \quad -\frac{P}{2}. \quad P + \infty. \quad (\breve{P}r + \infty)^4.$$

k' *t* *v* *M* *r*

$\breve{P}r + \infty$.

g

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FIG. 54. Prismatic Emerald.

The elevation copied from HAÜY, Traité, 2de Ed. Pl. 72. Fig. 153., the projection from the crystal in the cabinet of M. DE DRÉE.

FIG. 55. Prismatic Glauber-salt.

$$\underset{n}{\frac{P}{2}}. \quad -\underset{T}{\frac{\breve{P}r}{2}}. \quad -\underset{z}{\frac{P}{2}}. \quad \underset{o}{(\breve{P}r+\infty)^3}. \quad \underset{M}{\breve{P}r+\infty}.$$

$$\underset{P}{\bar{P}r+\infty}.$$

FIG. 56. Prismatic Glauber-salt.

$$\underset{l}{P-\infty}. \quad \underset{r}{\frac{\breve{P}r}{2}}. \quad \underset{n}{\frac{P}{2}}. \quad \underset{y}{\bar{P}r-1}. \quad -\underset{T}{\frac{\breve{P}r}{2}}. \quad -\underset{z}{\frac{P}{2}}.$$

$$-\underset{v}{\frac{(\bar{P}r)^3}{2}}. \quad -\underset{w}{\frac{\breve{P}r+1}{2}}. \quad -\underset{d}{\frac{(\breve{P})^3}{2}}.$$

$$\underset{o}{(\breve{P}r+\infty)^3}. \quad \underset{M}{\breve{P}r+\infty}. \quad \underset{P}{\bar{P}r+\infty}.$$

FIG. 57. Prismatoidal Gypsum-haloide.

$$\underset{l}{\frac{P}{2}}. \quad \underset{f}{P+\infty}. \quad \underset{P}{\breve{P}r+\infty}.$$

FIG. 58. Prismatoidal Gypsum-haloide.

$$\underset{l}{\frac{P}{2}}. \quad -\underset{o}{\frac{\frac{4}{3}\bar{P}r-2}{2}}. \quad \underset{f}{P+\infty}. \quad \underset{h}{(\breve{P}r+\infty)^3}.$$

$$\underset{P}{\breve{P}r+\infty}.$$

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FIG. 59. Prismatic Brithyne-salt.

$$\mathrm{P} - \infty. \quad \frac{\mathrm{P}}{2}.$$

$$P \qquad f$$

FIG. 60. Prismatic Brithyne-salt.

$$\mathrm{P} - \infty. \quad \frac{\mathrm{P}}{2}. \; -\frac{\breve{\mathrm{P}}\mathrm{r}}{2}. \; -\frac{\mathrm{P}}{2}. \; -\frac{(\breve{\mathrm{P}}\mathrm{r})^5}{2}.$$

$$P \qquad f \qquad t \qquad n \qquad e$$

$$\mathrm{P} + \infty. \quad \breve{\mathrm{P}}\mathrm{r} + \infty.$$

$$M \qquad s$$

FIG. 61. Prismatic Feld-spar.

$$\frac{\frac{3}{4}\breve{\mathrm{P}}\mathrm{r} + 2}{2}. \; -\frac{\breve{\mathrm{P}}\mathrm{r}}{2}. \; (\breve{\mathrm{P}}\mathrm{r} + \infty)^5. \; \bar{\mathrm{P}}\mathrm{r} + \infty.$$

$$y \qquad P \qquad T\ l \qquad M$$

FIG. 62. Prismatic Feld-spar.

$$\frac{\frac{4}{5}\breve{\mathrm{P}}\mathrm{r} - 2}{2}. \quad \frac{\breve{\mathrm{P}}\mathrm{r}}{2}. \quad \frac{\mathrm{P}}{2}. \quad \frac{\frac{3}{4}\breve{\mathrm{P}}\mathrm{r} + 2}{2}. \quad -\frac{\breve{\mathrm{P}}\mathrm{r}}{2}.$$

$$q \qquad x \qquad s \qquad y \qquad P$$

$$(\breve{\mathrm{P}}\mathrm{r} + \infty)^3. \quad (\bar{\mathrm{P}}\mathrm{r} + \infty)^5. \quad \bar{\mathrm{P}}\mathrm{r} + \infty.$$

$$T\ l \qquad z\ \breve{z} \qquad M$$

FIG. 63. Prismatic Azure-malachite.

$$\mathrm{P} - \infty. \; \frac{(\breve{\mathrm{P}}\mathrm{r} - 1)^7}{2} \; (\breve{\mathrm{P}}\mathrm{r} + \infty)^5. \; \bar{\mathrm{P}}\mathrm{r} + \infty.$$

$$s \qquad d \qquad P \qquad h$$

FIG. 64. Prismatic Azure-malachite.

$$\mathrm{P} - \infty. \; \frac{\bar{\mathrm{P}}\mathrm{r}}{2}. \; \frac{\mathrm{P}}{2}. \; \breve{\mathrm{P}}\mathrm{r}. \; -\frac{(\breve{\mathrm{P}}\mathrm{r} - 1)^5}{2}.$$

$$s \qquad a \qquad x \qquad M \qquad k$$

$$\bar{\mathrm{P}}\mathrm{r} + \infty.$$

$$h$$

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FIG. 65. Prismatic Azure-malachite.

$$P-\infty.\ \underset{s}{\frac{\breve{P}r}{2}}.\ \underset{a}{\breve{P}r}.\ \underset{M}{-\frac{\breve{P}r-1}{2}}.\ \underset{b}{-\frac{(\breve{P}r-1)^3}{2}}.\ \underset{k}{}$$

$$\underset{P}{(\breve{P}r+\infty)^3}.\ \underset{l}{(\breve{P}r+\infty)^5}.\ \underset{h}{\breve{P}r+\infty}.$$

FIG. 66. Prismatic Azure-malachite.

$$P-\infty.\ \underset{s}{\frac{\bar{P}r}{2}}.\ \underset{a}{\frac{P}{2}}.\ \underset{x}{\frac{(\breve{P}r-1)^7}{2}}.\ \underset{d}{\frac{(\bar{P}r-1)^6}{2}}.\ \underset{e}{}$$

$$\breve{P}r-1.\ \underset{g}{\breve{P}r}.\ \underset{M}{-\frac{(\breve{P}r-1)^5}{2}}.\ \underset{k}{-\frac{\bar{P}r}{2}}.\ \underset{c}{}$$

$$\underset{f}{P+\infty}.\ \underset{P}{(\breve{P}r+\infty)^3}.\ \underset{l}{(\bar{P}r+\infty)^5}.\ \underset{h}{\bar{P}r+\infty}.$$

FIG. 67. Prismatic Dystome-spar.

$$P-\infty.\ \underset{b}{\frac{P}{2}}.\ \underset{P}{\frac{\breve{P}r+1}{2}}.\ \underset{a}{\bar{P}r+1}.\ \underset{o}{P+\infty}.\ \underset{f}{}$$

$$\underset{g}{(\breve{P}r+\infty)^5}.\ \underset{s}{\breve{P}r+\infty}.$$

FIG. 68. Prismatic Dystome-spar.

$$P-\infty.\ \underset{b}{\frac{P}{2}}.\ \underset{P}{\frac{\breve{P}r+1}{2}}.\ \underset{a}{\bar{P}r}.\ \underset{d}{-\frac{(\breve{P}r)^3}{2}}.\ \underset{e}{}$$

$$\underset{f}{P+\infty}.\ \underset{g}{(\breve{P}r+\infty)^3}.$$

FIG. 69. Prismatic Dystome-spar.

$$P-\infty.\ \underset{b}{\frac{P}{2}}.\ \underset{P}{\frac{\breve{P}r+1}{2}}.\ \underset{a}{\frac{(\bar{P}r)^5}{2}}.\ \underset{q}{\bar{P}r}.\ \underset{d}{}$$

$$\underset{o}{\bar{P}r+1}.\ \underset{n}{-\frac{P}{2}}.\ \underset{e}{-\frac{(\breve{P}r)^3}{2}}.\ \underset{i}{-\frac{(\breve{P}r)^5}{2}}.$$

$$\underset{f}{P+\infty}.\ \underset{g}{(\breve{P}r+\infty)^3}.\ \underset{u}{\bar{P}r+\infty}.$$

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FIG. 70. Prismatic Dystome-spar.

$$\underset{b}{P-\infty}.\quad \underset{P}{\frac{\breve{P}}{2}}.\quad \underset{a}{\frac{\breve{P}r+1}{2}}.\quad \underset{q}{\frac{(\bar{P}r)^3}{2}}.\quad \underset{d}{\bar{P}r}.$$

$$\underset{r}{\tfrac{3}{4}\bar{P}r+1}.\quad \underset{o}{\bar{P}r+1}.\quad \underset{n}{-\frac{P}{2}}.\quad \underset{e}{-\frac{(\breve{P}r)^3}{2}}.$$

$$\underset{p}{-\frac{(\bar{P}-1)^3}{2}}.\quad \underset{i}{-\frac{(\breve{P}r)^5}{2}}.\quad \underset{l}{-\frac{(\breve{P})^4}{2}}.$$

$$\underset{h}{-\frac{(\breve{P}r+1)^3}{2}}.\quad \underset{m}{-\frac{(\breve{P})^5}{2}}.\quad \underset{f}{P+\infty}.$$

$$\underset{g}{(\breve{P}r+\infty)^3}.$$

FIG. 71. Prismatic Habroneme-malachite.

$$\underset{a}{P-\infty}.\quad \underset{b}{\frac{\breve{P}r-1}{2}}.\quad \underset{P}{\frac{P}{2}}.\quad \underset{o}{\bar{P}r}.\quad \underset{b}{-\frac{\breve{P}r-1}{2}}.$$

$$\underset{d}{-\frac{(\bar{P}r-1)^3}{2}}.\quad \underset{f}{(\bar{P}r+\infty)^3}.\quad \underset{e}{\breve{P}r+\infty}.$$

FIG. 72. Paratomous Augite-spar.

$$\underset{s}{\frac{P}{2}}.\quad \underset{M}{(\breve{P}r+\infty)^3}.\quad \underset{r}{\breve{P}r+\infty}.\quad \underset{l}{\bar{P}r+\infty}.$$

FIG. 73. Paratomous Augite-spar.

$$\underset{P}{\frac{\breve{P}r}{2}}.\quad \underset{s}{\frac{P}{2}}.\quad \underset{o}{\frac{(\bar{P}r)^5}{2}}.\quad \underset{t}{-\frac{\breve{P}r}{2}}.\quad \underset{z}{-\frac{(\bar{P}r)^5}{2}}.$$

$$\underset{M}{(\breve{P}r+\infty)^3}.$$

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FIG. 74. Hemi-prismatic Augite-spar.

$$\frac{\breve{P}}{2}. \quad -\frac{\breve{P}r}{2}. \quad (\breve{P}r+\infty)^3. \quad \bar{P}r+\infty.$$
$$r \qquad P \qquad M \qquad x$$

FIG. 75. Prismatoidal Augite-spar.

$$\frac{\breve{P}r}{2}. \quad \frac{\breve{P}}{2}. \quad -\frac{\breve{P}r}{2}. \quad \breve{P}r+\infty.$$
$$r \quad n \qquad T \qquad M$$

FIG. 76. Hemi-prismatic Augite-spar.

$$\frac{\breve{P}}{2}. \quad \frac{\frac{5}{4}\breve{P}r+2}{2}. \quad \frac{(\bar{P}r)^5}{2}. \quad \frac{(\bar{P})^5}{2}. \quad -\frac{\breve{P}r}{2}.$$
$$r \qquad t \qquad a \qquad i \qquad P$$
$$-\frac{(\bar{P}r)^5}{2}. \quad -\frac{(\breve{P})^3}{2}. \quad -\frac{\frac{3}{4}P+2}{2}.$$
$$z \qquad k \qquad b$$
$$(\breve{P}r+\infty)^3. \quad (\bar{P}r+\infty)^5. \quad \breve{P}r+\infty.$$
$$M \qquad c \qquad s$$
$$\bar{P}r+\infty.$$
$$x$$

FIG. 77. Prismatoidal Augite-spar.

$$P-\infty. \quad \frac{\breve{P}r}{2}. \quad \frac{P}{2}. \quad \frac{(\breve{P})^3}{2}. \quad \bar{P}r-1. \quad \bar{P}r.$$
$$l \qquad r \qquad n \qquad x \qquad y \qquad q$$
$$-\frac{\breve{P}r}{2}. \quad -\frac{(\breve{P}r-1)^3}{2}. \quad -\frac{P}{2}. \quad -\frac{(\breve{P})^3}{2}.$$
$$T \qquad u \qquad z \qquad d$$
$$(\breve{P}r+\infty)^3. \quad \breve{P}r+\infty.$$
$$o \qquad M$$

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FIG. 78. Hemi-prismatic Habroneme-malachite.

$$-\frac{\breve{P}r}{2}.\ P+\infty.\ \breve{P}r+\infty.\ \left\{\breve{P}r+\infty\right\}.$$

$$p \qquad M \qquad s$$

FIG. 79. Prismatic Feld-spar.

$$\frac{\breve{P}r}{2}.\ \frac{P}{2}.\ \frac{\frac{3}{4}\breve{P}r+2}{2}.\ -\frac{\breve{P}r}{2}.\ (\breve{P}r+\infty)^3.$$

$$x \quad s \quad y \quad P \quad T\ l$$

$$\breve{P}r+\infty.\ \left\{-l\,\frac{(\breve{P}r)^3}{4}\right\}.$$

$$M$$

FIG. 80. Prismatic Feld-spar.

$$\frac{\frac{3}{4}\breve{P}r+2}{2}.\ -\frac{\breve{P}r}{2}.\ (\breve{P}r+\infty)^3.\ \breve{P}r+\infty.$$

$$y \qquad P \qquad T\ l \qquad M$$

$$\left\{r\,\breve{P}r+\infty : \breve{P}r+\infty.\ \breve{P}r+\infty\right\}.$$

FIG. 81. Prismatic Feld-spar.

$$\frac{\frac{3}{4}\breve{P}r+2}{2}.\ -\frac{\breve{P}r}{2}.\ (\breve{P}r+\infty)^3.\ \breve{P}r+\infty.$$

$$y \qquad P \qquad T\ l \qquad M$$

$$\left\{l\,\breve{P}r+\infty : \breve{P}r+\infty.\ \breve{P}r+\infty\right\}.$$

FIG. 82. Prismatic Disthene-spar.

$$\frac{\breve{P}r}{2}.\ r\,\frac{P+\infty}{2}.\ \breve{P}r+\infty.$$

$$P \qquad T \qquad M$$

FIG. 83. Tetarto-prismatic Vitriol-salt.

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FIG. 84. Albite.

$$\frac{\breve{P}r}{2}.\ r\,\frac{P}{4}.\ -\,\frac{\breve{P}r}{2}.\ r\,\frac{(\breve{P}r+\infty)^3}{2}.$$

$x\quad s\quad P\quad l$

$$l\,\frac{(\breve{P}r+\infty)^3}{2}.\ \bar{P}r+\infty.$$

$T\quad M$

FIG. 85. Albite.

$$\frac{\breve{P}r}{2}.\ r\,\frac{P}{4}.\ \frac{\frac{3}{4}\breve{P}r+2}{2}.\ r\,\frac{\bar{P}r-1}{2}.\ -\,\frac{\breve{P}r}{2}.$$

$x\quad s\quad y\quad g\quad P$

$$-\,r\,\frac{(\bar{P}r)^3}{4}.\ r\,\frac{(\breve{P}r+\infty)^3}{2}.\ l\,\frac{(\breve{P}r+\infty)^3}{2}.$$

$n\quad l\quad T$

$$r\,\frac{(\bar{P}r+\infty)^5}{2}.\ l\,\frac{(\bar{P}r+\infty)^5}{2}.\ \bar{P}r+\infty.$$

$z\quad z'\quad M$

FIG. 86. Albite.

$$\frac{\breve{P}r}{2}.\ r\,\frac{P}{4}.\ l\,\frac{P}{4}.\ \frac{\frac{3}{4}\breve{P}r+2.}{2}.\ -\,\frac{\breve{P}r}{2}.$$

$x\quad s\quad s'\quad y\quad P$

$$-\,r\,\frac{(\bar{P}r)^3}{4}.\ r\,\frac{(\breve{P}r+\infty)^3}{2}.\ l\,\frac{(\breve{P}r+\infty)^3}{2}.$$

$n\quad l\quad T$

$$r\,\frac{(\bar{P}r+\infty)^5}{2}.\ l\,\frac{(\bar{P}r+\infty)^5}{2}.\ \bar{P}r+\infty.$$

$z\quad z'\quad M$

FIG. 87. Albite.

$$\frac{\breve{P}r}{2}.\ r\,\frac{P}{4}.\ -\,\frac{\breve{P}r}{2}.\ r\,\frac{(\breve{P}r+\infty)^3}{2}.$$

$x\quad s\quad P\quad l$

$$l\,\frac{(\breve{P}r+\infty)^3}{2}.\ r\,\frac{(\bar{P}r+\infty)^5}{2}.\ l\,\frac{(\bar{P}r+\infty)^5}{2}.$$

$T\quad z\quad z'$

$$\bar{P}r+\infty.\ \left\{\breve{P}r+\infty\right\}.$$

M

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FIG. 88. Albite.

$$\frac{\breve{P}r}{2}. \quad -\frac{\breve{P}r}{2}. \quad r\frac{(\breve{P}r+\infty)^5}{2}. \quad l\frac{(\breve{P}r+\infty)^5}{2}.$$

x P l T

$$\bar{P}r+\infty. \quad \left\{-\frac{\breve{P}r}{2} : +\frac{\breve{P}r}{2}. \quad -\frac{\breve{P}r}{2}\right\}.$$

M

FIG. 89. Prismatic Axinite.

$$-l\frac{(\bar{P}r)^5}{4}. \quad -l\frac{(\breve{P})^5}{4}. \quad -l\frac{\frac{3}{4}P+2}{4}.$$

x u s

$$-l\frac{(\breve{P}r)^7}{4}. \quad r\frac{(\breve{P}r+\infty)^5}{2}. \quad \bar{P}r+\infty.$$

l P r

FIG. 90. Prismatic Axinite.

$$-l\frac{(\breve{P})^3}{4}. \quad r\frac{(\breve{P}r+\infty)^5}{2}. \quad \bar{P}r+\infty.$$

u P r

FIG. 91. Prismatic Axinite.

$$\frac{\breve{P}r}{2}. \quad r\frac{P}{4}. \quad l\frac{P}{4}. \quad \frac{\frac{3}{4}\breve{P}r+2}{2}. \quad -\frac{\breve{P}r}{2}.$$

v t t' y T

$$-r\frac{(\bar{P}r)^5}{4}. \quad -l\frac{(\bar{P}r)^5}{4}. \quad -l\frac{(\breve{P})^5}{4}.$$

n x u

$$-l\frac{\frac{3}{4}P+2}{4}. \quad -l\frac{(\breve{P}r)^7}{4}. \quad r\frac{(\breve{P}r+\infty)^5}{2}.$$

s l P

$$l\frac{(\breve{P}r+\infty)^3}{2}. \quad l\frac{(\bar{P}r+\infty)^5}{2}. \quad \bar{P}r+\infty.$$

M z r

FIG. 92. Pyramidal Lead-baryte.

$$P-\infty. \quad {}^{2}\!/_{3}\,P-3.$$

a b

FIG. 93. Pyramidal Lead-baryte.

$$P-\infty. \quad {}^{2}\!/_{3}\,P-3. \quad P.$$

a b P

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FIG. 94. Pyramidal Lead-baryte.

$P - \infty$. $\frac{2}{3}P$ $P - 3$. $P - 3$.

a *b* *c*

FIG. 95. Pyramidal Lead-baryte.

$\frac{2}{3}P$ $P - 3$. $\frac{2}{3}P$ $P - 2$. $P - 1$. P.

b *d* *e* *P*

FIG. 96. Pyramidal Garnet.

$P - \infty$. $P - 1$. P. $(P - 2)^3$.

P *o* *c* *a*

$(P - 1)^3$. $P + 2$. $(P)^3$. $(P)^4$.

z *b* *s* *x*

$(P + 1)^3$. $P + 4$. $(P + \infty)^3$.

e *r* *h*

$[(P + \infty)^3]$. $P + \infty$. $[P + \infty]$.

f *d* *M*

FIG. 97. Pyramidal Kouphone-spar.

P. $[P + \infty]$.

P *m*

FIG. 98. Pyramidal Kouphone-spar.

$P - \infty$. $\frac{4}{5}P - 4$. $\frac{4}{5}P - 3$. $\frac{2}{3}P - 3$.

o *b* *d* *e*

$P - 3$. P. $[(P + \infty)^3]$. $[P + \infty]$.

c *P* *r* *m*

FIG. 99. Pyramidal Zircon.

$P - 1$. P. $(P)^3$. $(P)^4$. $(P)^5$.

t *P* *x* *y* *z*

$P + \infty$. $[P + \infty]$.

l *s*

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FIG. 100. Pyramidal Titanium-ore.

$P - \infty$. $\frac{4}{5}P - 4$. $(\frac{4}{5}P - 7)^4$?

o *r* *s*

P. P + 1.

P *q*

FIG. 101. Pyramidal Tin-ore.

P + 1. P + ∞. [P + ∞].

s *t* *g*

FIG. 102. Pyramidal Tin-ore.

P. P + 1. P + ∞. [P + $\overline{\infty}$].

P *s* *l* *g*

FIG. 103. Pyramidal Tin-ore.

P. P + 1. (P)^5. (P + ∞)^5. [P + ∞].

P *s* *z* *r* *g*

FIG. 104. Pyramidal Melichrone-resin.

P − ∞. P − 1. P. [P + ∞].

o *t* *P* *g*

FIG. 105. Pyramidal Manganese-ore.

$\frac{4}{5}P - 4$. P.

a *P*

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FIG. 106. Pyramidal Manganese-ore.

$$P, \left\{\frac{P-1}{4}\right\}.$$

P

FIG. 107. Pyramidal Manganese-ore.

$$P, \{P\}.$$

P

FIG. 108. Pyramidal Scheelium-baryte.

$$P.\ \frac{r}{l}\frac{(\frac{2}{3}\infty\frac{2}{3}P-2)^5}{2}.\ P+1.\ \frac{l}{r}\frac{(P+1)^5}{2}.$$

g *a* *P* *b*

FIG. 109. Pyramidal Copper-pyrites.

$$P-\infty.\ P-1.\ \frac{P}{2}.\ -\frac{P}{2}.\ P+1.$$

a *b* *P* *P'* *c*

FIG. 110. Fergusonite.

$$P-\infty.\ P.\ \frac{[(P+\infty)^5]}{2}.$$

i *s* *r*

FIG. 111. Rhombohedral Alum-haloide.

$$R-\infty.\ R.$$

o *R*

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FIG. 112. Rhombohedral Fluor-haloide.

R — ∞. P — 1. P + ∞.

P *r* *M*

FIG. 113. Rhombohedral Lime-haloide.

R — ∞. R + 2.

o *m*

FIG. 114. Rhombohedral Lime-haloide.

R. R + ∞.

P *c*

FIG. 115. Rhombohedral Lime-haloide.

R — ∞. R. R + 2.

o *P* *m*

FIG. 116. Rhombohedral Lime-haloide.

R. $(P)^{5}$. $(P)^{5}$. R + 2. R + ∞.

P *r* *y* *m* *c*

FIG. 117. Rhombohedral Lead-baryte.

P. P + ∞.

P, *s* *n*, *n'*

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FIG. 118. Rhombohedral Emerald-malachite.

R + 1. P + ∞.
r *s*

FIG. 119. Rhombohedral Euchlore-mica.

R — ∞. R.
o *R*

FIG. 120. Rhombohedral Kouphone-spar.

R — 1. R. R + 1.
n *P* *r*

FIG. 121. Rhombohedral Corundum.

R — ∞. R. P + 1. P + ∞.
o *P* *r* *s*

FIG. 122. Rhombohedral Corundum.

P + 1. R + 1. P + 2. P + ∞.
r *a* *b* *s*

FIG. 123. Rhombohedral Corundum.

R — ∞. $\frac{7}{6}$P + 1. $\frac{3}{4}$P + 3. P + 3.
o *c* *l* *e*

P + ∞.
s

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FIG. 124. Rhombohedral Iron-ore.

$$\underset{s}{R-2.}\quad \underset{P}{R.}\quad \underset{n}{P+1.}$$

FIG. 125. Peritomous Ruby-blende.

$$\underset{o}{R-\infty.}\quad \underset{u}{R-2.}\quad \underset{x}{\tfrac{4}{5}R-2.}\quad \underset{k}{\tfrac{4}{5}R-1.}$$

$$\underset{a}{R-1.}\quad \underset{P}{R.}\quad \underset{l}{R+\infty.}$$

FIG. 126. Rhombohedral Ruby-blende.

$$\underset{z}{R-1.}\quad \underset{t}{(P-2)^3.}\quad \underset{P}{R.}\quad \underset{a}{(P-1)^3.}$$

$$\underset{b}{(\tfrac{5}{4}P-1)^3.}\quad \underset{h}{(P)^3.}\quad \underset{n}{P+\infty.}$$

FIG. 127. Eudialyte.

$$\underset{o}{R-\infty.}\quad \underset{z}{R-2.}\quad \underset{P}{R.}\quad \underset{u}{P+\infty.}$$

FIG. 128. Rhombohedral Kouphone-spar.

$$\underset{P}{R.}\quad 2\left\{R-\infty\right\}.$$

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FIG. 129. Rhombohedral Lime-haloide.

$$(P-2)^{s}.\ (P)^{s}.\ \left\{R-\infty\right\}.$$
$$t \qquad r$$

FIG. 130 and 131. Rhombohedral Lime-haloide.

$$R.\ \left\{\frac{R-1}{3}\right\}.$$
$$P$$

FIG. 132. Rhombohedral Lime-haloide.

$$R-\infty.\ \ R+\infty.\ \ \left\{\frac{R}{3}\right\}.$$
$$o \qquad c$$

FIG. 133. Rhombohedral Lime-haloide.

$$R-\infty.\ \ R+\infty.\ \ \left\{\frac{R-1}{3}\right\}.$$
$$o \qquad c$$

FIG. 134. Rhombohedral Lime-haloide.

$$R.\ \left\{\frac{R+\infty}{3}\right\}.$$
$$P$$

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FIG. 135. Rhombohedral Lime-haloide.

$$\underset{g}{\mathrm{R}-1}.\ \underset{c}{\mathrm{R}+\infty}.\ 2\left\{\mathrm{R}-\infty\right\}.$$

FIG. 136. Rhombohedral Ruby-blende.

$$\underset{z}{\mathrm{R}-1}.\ \underset{k}{\frac{\mathrm{R}+\infty}{2}}.\ \underset{n}{\mathrm{P}+\infty}.$$

FIG. 137. Rhombohedral Tourmaline.

$$\underset{P}{\mathrm{R}}.\ \underset{o}{\mathrm{R}+1}.\ \underset{s}{\mathrm{P}+\infty}.\ \underset{k'}{\mathrm{R}-\infty}.$$

FIG. 138. Rhombohedral Tourmaline.

$$\underset{k}{\mathrm{R}-\infty}.\ \underset{n}{\mathrm{R}-1}.\ \underset{P}{\mathrm{R}}.\ \underset{l}{\frac{[\mathrm{R}+\infty]}{2}}.\ \underset{s}{\mathrm{P}+\infty}.$$

$$\underset{n'}{\mathrm{R}-1}.\ \underset{k'}{\mathrm{R}-\infty}.$$

FIG. 139. Rhombohedral Ruby-blende.

$$\underset{z}{\mathrm{R}-1}.\ \underset{n}{\mathrm{P}+\infty}.\ \left\{\frac{\mathrm{R}-1.\ \mathrm{R}-1}{3}\right\}.$$

FIG. 140. Rhombohedral Ruby-blende.

$$\underset{z}{\mathrm{R}-1}.\ \underset{n}{\mathrm{P}+\infty}.\ \left\{\mathrm{R}-1.\ \mathrm{R}-1\right\}.$$

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FIG. 141. Axotomous Iron-ore.

$$\underset{a}{\mathrm{R}-\infty}.\quad \underset{R}{\mathrm{R}}.\quad \frac{\mathrm{r}}{\mathrm{l}}\,\underset{b}{\frac{\mathrm{P}+1}{2}}.$$

FIG. 142. Axotomous Iron-ore.

$$\underset{a'}{\mathrm{R}-\infty}.\quad \underset{R'}{\mathrm{R}}.\quad \frac{\mathrm{l}}{\mathrm{r}}\,\underset{b'}{\frac{\mathrm{P}+1}{2}}.$$

FIG. 143. Axotomous Iron-ore.

$$\underset{a}{\mathrm{R}-\infty}.\quad \underset{R}{\mathrm{R}}.\quad \frac{\mathrm{r}}{\mathrm{l}}\,\underset{b}{\frac{\mathrm{P}+1}{2}},\ 2\left\{\mathrm{R}-\infty\right\}.$$

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FIG. 144. Axotomous Iron-ore.

$$\underset{a}{R-\infty}.\quad \underset{c}{R-1}.\quad \underset{R}{R}.\quad \underset{b}{\frac{1}{r}\frac{P+1}{2}}.\quad \underset{d}{R+1}.$$

FIG. 145. Rhombohedral Quartz.

$$\underset{P,z}{P}.\quad \underset{s}{R}.\quad \underset{r,r'}{P+\infty}.\quad \underset{s'}{-R}.\quad \underset{z,P}{P}.$$

FIG. 146. Rhombohedral Quartz.

$$\underset{P,z}{P}.\quad \underset{s}{R}.\quad \underset{x}{\frac{r}{r}\frac{(P)^{\frac{7}{3}}}{2}}.\quad \underset{y}{\frac{r}{r}\frac{(P)^{3}}{2}}.\quad \underset{u}{\frac{r}{r}\frac{(P)^{\frac{11}{3}}}{2}}.$$

$$\underset{z}{\frac{r}{r}\frac{(P)^{5}}{2}}.\quad \underset{r,r'}{P+\infty}.$$

FIG. 147. Rhombohedral Quartz.

$$\underset{P,z}{P}.\quad \underset{s}{\frac{+R}{2}}.\quad \underset{o}{\frac{r}{-r}\frac{(P)^{\frac{5}{3}}}{2}}.\quad \underset{x}{\frac{1}{-1}\frac{(P)^{\frac{7}{3}}}{2}}.\quad \underset{y}{\frac{1}{-1}\frac{(P)^{3}}{2}}.\quad \underset{u}{\frac{1}{-1}\frac{(P)^{\frac{11}{3}}}{2}}.$$

$$\underset{v}{\frac{1}{-1}\frac{(P)^{5}}{2}}.\quad \underset{b}{\tfrac{5}{3}P}.\quad \underset{m}{\tfrac{3}{4}P+2}.\quad \underset{a}{P+2}.\quad \underset{r}{P+\infty}.\quad \underset{d}{\frac{[(P+\infty)^{\frac{5}{2}}]}{2}}.$$

FIG. 148. Rhombohedral Fluor-haloide.

$$\underset{P}{R-\infty}.\quad \underset{a}{2\,(R-1)}.\quad \underset{x}{P}.\quad \underset{s}{2\,(R)}.$$

$$\underset{z}{P+1}.\quad \underset{u}{\frac{1}{r}\frac{2\left((P)^{\frac{5}{3}}\right)}{2}}.\quad \underset{c}{\frac{1}{r}\frac{(P+\infty)^{\frac{5}{3}}}{2}}.$$

$$\underset{e}{R+\infty}.\quad \underset{M}{P+\infty}.$$

FIG. 149. Rhombohedral Fluor-haloide.

$$\underset{P}{R-\infty}.\quad \underset{r}{P-1}.\quad \underset{a}{2\,(R-1)}.\quad \underset{x}{P}.$$

$$\underset{s}{2\,(R)}.\quad \underset{z}{P+1}.\quad \underset{a}{\frac{1}{r}\frac{2\left((P)^{\frac{5}{3}}\right)}{2}}.$$

$$\underset{b}{\frac{1}{r}\frac{2\left((P)^{\frac{7}{3}}\right)}{2}}.\quad \underset{c}{R+\infty}.\quad \underset{M}{P+\infty}.$$

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FIG. 150. Rhombohedral Emerald.

$$R - \infty.\ P.\ 2(R).\ P + 1.\ 2((P)^{\frac{5}{3}}).$$
$$P \quad t \quad s \quad u \quad a$$
$$P + \infty.$$
$$M$$

FIG. 151. Octahedral Fluor-haloide.

H. D.

i *s*

FIG. 152. Octahedral Fluor-haloide.

H. A_3.

i *x*

FIG. 153. Hexahedral Kouphone-spar.

H. C_1.

P *o*

FIG. 154. Dodecahedral Garnet.

D. C_1.

P *n*

FIG. 155. Hexahedral Lead-glance.

H. O. D. B.

P *c* *o* *l*

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FIG. 156. Dodecahedral Corundum.

$$O. \quad \left\{\frac{O}{4}\right\}.$$

P

FIG. 157. Hexahedral Gold.

$$C_2. \quad \left\{\frac{O}{4}\right\}.$$

o

FIG. 158. Tetrahedral Copper-glance.

$$\frac{O}{2}. \quad -\frac{O}{2}.$$

P *e*

FIG. 159 and 160. Tetrahedral Boracite.

$$H. \quad \frac{O}{2}. \quad D.$$

P *s* *n*

FIG. 161. Tetrahedral Copper-glance.

$$\frac{O}{2}. \quad D. \quad \frac{C_1}{2}. \quad 2\left\{\frac{O}{4}\right\}.$$

P *o* *l*

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FIG. 162. Dodecahedral Garnet-blende.

$$D.\ \frac{C_2}{2}.$$

P *y*

FIG. 163. Dodecahedral Garnet-blende.

$$D.\ \left\{\frac{O}{4}\right\}.$$

P

FIG. 164. Octahedral Diamond.

$$\frac{O}{2}.\ -\frac{T}{2}.\ 2\left\{H\right\}.$$

P *n*

FIG. 165. Hexahedral Iron-pyrites.

$$H.\ \frac{A_2}{2}.$$

P *e*

FIG. 166. Hexahedral Iron-pyrites.

$$O.\ \frac{A_2}{2}.$$

d *e*

FIG. 167. Hexahedral Iron-pyrites.

$$H.\ O.\ \frac{A_2}{2}.\ C_1.\ \frac{T_3}{2}.$$

P *d* *e* *u* *s*

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FIG. 168. Prismatic Epsom-salt.

$$\breve{P}r.\quad \bar{P}r.\quad P.\quad \breve{P}r+1.\quad \bar{P}r+1,\quad \frac{r}{r}\frac{(\breve{P}r)^3}{2}.\quad \frac{l}{l}\frac{(\bar{P}r)^3}{2}.$$

n *m* *l* *r* *q* *t* *s*

$$P+\infty.\quad \breve{P}r+\infty.\quad \bar{P}r+\infty.$$

M *o* *p*

FIG. 169. Di-prismatic Lead-baryte.

$$P-\infty.\quad P-1.\quad \breve{P}r.\quad P.\quad (\breve{P}r)^3.\quad \tfrac{3}{4}\breve{P}r+2.\quad \bar{P}r+1.\quad (\bar{P}r)^3.$$

g *w* *M* *t* *v* *e* *y* *o*

$$P+\infty.\quad (\breve{P}r+\infty)^5.\quad (\bar{P}r+\infty)^3.\quad \breve{P}r+\infty.\quad \bar{P}r+\infty.$$

P *u* *s* *l* *h*

FIG. 170. Hemi-prismatic Lead-baryte.

$$\frac{P}{2}.\quad \breve{P}r.\quad \breve{P}r+1.\quad -\frac{\bar{P}r}{2}.\quad -\frac{P}{2}.\quad -\frac{(\bar{P})^3}{2}.\quad P+\infty.$$

t *z* *y* *k* *v* *b* *M*

$$(\breve{P}r+\infty)^3.\quad \breve{P}r+\infty.\quad \bar{P}r+\infty.$$

a *g* *f*

FIG. 171. Axotomous Lead-baryte.

$$P-\infty.\quad \frac{\breve{P}r-1}{2}.\quad \frac{\breve{P}r}{2}.\quad \frac{\breve{P}r+1}{2}.\quad \frac{P-1}{2}.\quad \frac{(\breve{P}-2)^4}{2}.$$

a *i* *f* *e* *g* *h*

$$\frac{(\breve{P}r-1)^3}{2}.\quad \frac{P}{2}.\quad \frac{(\breve{P}-2)^8}{2}.\quad \bar{P}r-2.\quad \bar{P}r-1.$$

k *P* *o* *l* *m*

$$\tfrac{3}{4}\bar{P}r.\quad -\frac{\breve{P}r+1}{2}.\quad -\frac{P-1}{2}.\quad -\frac{(\breve{P}-2)^4}{2}.\quad -\frac{(\breve{P}r-1)^3}{2}.$$

n *e'* *g'* *h'* *k'*

$$-\frac{P}{2}.\quad -\frac{(\breve{P}-2)^8}{2}.\quad P+\infty.\quad (\breve{P}+\infty)^4.\quad \breve{P}r+\infty.$$

P' *o'* *c* *d* *b*

FIG. 172. Prismatic Cobalt-mica.

$$\frac{\breve{P}r}{2}.\quad \frac{P}{2}.\quad (\breve{P}r+\infty)^3.\quad (\breve{P}r+\infty)^5.\quad \breve{P}r+\infty.\quad \bar{P}r+\infty.$$

M *l* *k* *s* *T* *P*

FIG. 173. Rhombohedral Kouphone-spar.

$$R-1.\quad R.\quad R+1.\quad P+\infty,\quad 2\{R-\infty\}.$$

n *P* *r* *u*

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FIG. 174. Prismatic Kouphone-spar, from Auvergne.

FIG. 175. Mesolite from Iceland.

FIG. 176. Paratomous Augite-spar.

$$\frac{\breve{P}r}{2}. \quad \frac{P}{2}. \quad \frac{(\breve{P}r)^5}{2}. \quad -\frac{\breve{P}r}{2}. \quad -\frac{(\breve{P})^5}{2}.$$

$$P \qquad s \qquad o \qquad t \qquad u$$

$$(\breve{P}r+\infty)^5. \quad \breve{P}r+\infty. \quad \bar{P}r+\infty.$$

$$M \qquad r \qquad l$$

FIG. 177. Horizontal projection of the same.

FIG. 178. Pyramidal Copper-pyrites.

$$P-\infty. \quad \frac{P}{2}. \quad \frac{2\breve{N}2}{3}P-2. \quad P-1. \quad \frac{3}{2\breve{N}2}P.$$

$$a \qquad P \qquad g \qquad b \qquad h$$

$$P+1. \quad -\frac{P-4}{2}. \quad -\frac{\frac{2\breve{N}2}{3}P-3}{2}.$$

$$c \qquad d \qquad e$$

$$\frac{(\frac{2\breve{N}2}{3}P-5)^5}{2}. \quad -\frac{P}{2}.$$

$$f \qquad P'$$

FIG. 179. Pyramidal Copper-pyrites.

$$\frac{P}{2}. \quad P+1. \quad \left\{P-1. \quad P\right\}.$$

Regular composition of five individuals, each of the lateral ones being joined to the central individual, in a plane perpendicular to a terminal edge of P.

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FIG. 180. Hexahedral Gold.

$$C_2. \left\{\frac{O}{4}\right\}.$$

o

FIG. 181. Di-prismatic Copper-glance.

$$P-\infty.\ \breve{P}r-1.\ \breve{P}r.\ \breve{P}r+1.\ \breve{P}r-1.$$

k *e* *d* *f* *o*

$$(\breve{P}r-1)^3.\ P.\ \bar{P}r.\ (\breve{P}r+\infty)^5.$$

y *P* *p* *n*

$$\breve{P}r+\infty.\ \bar{P}r+\infty.$$

s *r*

FIG. 182. Rhombohedral Ruby-blende.

$$R-1.\ P+\infty.\ R+1.\ R-1.$$

z *n* *g* *z*

FIG. 183. Hemi-prismatic Ruby-blende.

$$P-\infty.\ -\frac{\breve{P}r+1}{2}.\ P+\infty.$$

b *t* *f*

FIG. 184. Hemi-prismatic Sulphur.

$$\frac{\breve{P}r}{2}.\ \frac{P}{2}.\ \frac{(\bar{P}r)^3}{2}.\ -\frac{\breve{P}r}{2}.\ -\frac{P}{2}.$$

t *n* *q* *P* *n'*

$$-\frac{(\bar{P}r)^3}{2}.\ -\frac{(\breve{P})^3}{2}.\ P+\infty.$$

q' *l* *f*

$$(\breve{P}r+\infty)^7.\ (\breve{P}r+\infty)^5.\ (\bar{P}r+\infty)^5.$$

w *g* *v*

$$\breve{P}r+\infty.\ \bar{P}r+\infty.$$

s *u*

FIG. 185. Allanite.

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FIG. 186. Acmite.

FIG. 187. Babingtonite, copied from Mr LE'VY's figure.

FIG. 188. Baryto-Calcite.

FIG. 189. Brewsterite.

FIG. 190. Brookite, copied from Mr LE'VY's figure.

$\breve{P}r - 1$. $\breve{P}r$. $(\frac{4}{3}\breve{P} - 2)^3$. $(\breve{P}r - 1)^3$.

a^2 a^1 i $b^{\frac{1}{2}}$

$\frac{4}{3}\breve{P}r$. P. $(\breve{P}r + \infty)^3$. $\breve{P}r + \infty$.

$e^{\frac{3}{8}}$ e^3 m h^1

$\breve{P}r + \infty$.

g^1

FIG. 191. Childrenite.

$\frac{4}{5}$ P. P. $\frac{3}{4}\breve{P}r + 2$. $\breve{P}r + \infty$.

b e a P

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FIG. 192. Euchroite.

$$\underset{P}{P-\infty}. \quad \underset{n}{\breve{P}r}. \quad P+\infty. \quad \underset{s}{(\breve{P}r+\infty)^5}.$$

$$\underset{l}{(\breve{P}r+\infty)^5}. \quad \underset{k}{\breve{P}r+\infty}.$$

FIG. 193. Fergusonite.

$$\underset{i}{P-\infty}. \quad \underset{s}{P}. \quad \underset{z}{\frac{(P-1)^5}{2}}. \quad \underset{r}{\frac{[(P+\infty)^5]}{2}}.$$

FIG. 194. Levyne.

$$\underset{o}{R-\infty}. \quad \underset{g}{R-1}. \quad \underset{P}{R}. \quad 2\left\{R-\infty\right\}.$$

FIG. 195. Roselite, copied from Mr LÉVY's figure.

FIG. 196. Gmelinite.

$$\underset{o}{R-\infty}. \quad \underset{y}{P}. \quad \underset{u}{P+\infty}.$$

FIG. 197. Wagnerite, copied from a drawing by Dr G. ROSE.

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